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THE GREAT RUSSIAN TELESCOPE.

We have seen the wonders of the starlit sky through the largest and best refracting telescope in the world; but the wonderful instrument is not destined to remain in this country. The most important part of it, the object glass, with the cell that holds it in place, will soon be on its way to the Russian Observatory of Pulkowa, located on the Pulkowa hills, nine miles south of St. Petersburg, and commanding a fine view of the capital. The observatory was built and richly endowed by the Czar Nicholas in 1839, and has won high renown on astronomical annals for the work it has already accomplished under its first director, the eminent astronomer Wilhelm Struve, as well as under his son, Otto Struve, who became director in 1864, upon the death of his distinguished father, and still holds the honorable position.

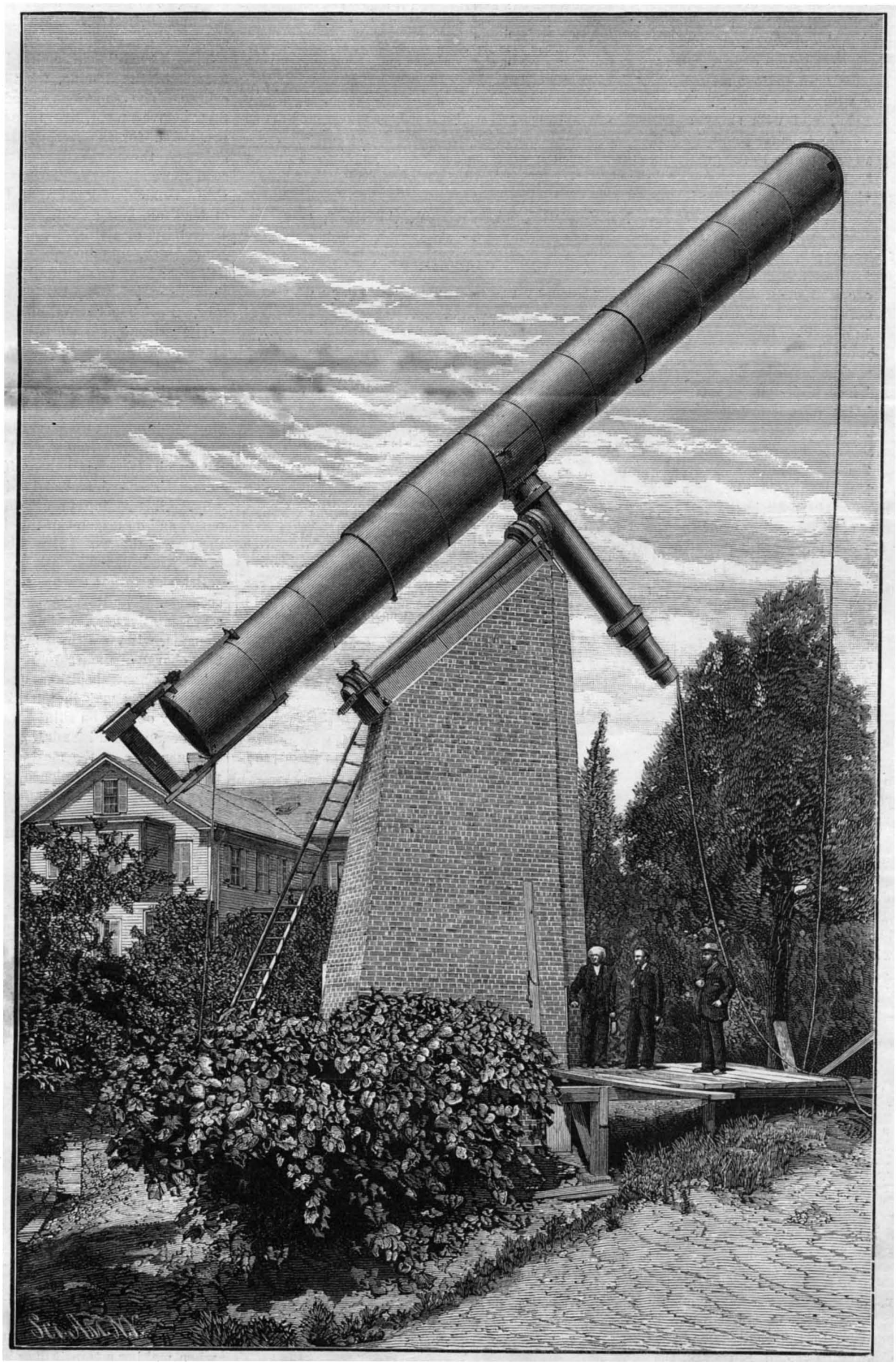
The Russian Government was not satisfied with the capacity and size of the present working force of the observatory, and determined to have a new refracting telescope constructed which, in mechanism and optic power, should surpass any telescope in existence. The director (Struve) was commissioned to carry out the plan. The most perfect workmanship attainable was to be put in requisition, and Struve chose from all the world, for the execution of the difficult and delicate task, the Messrs. Alvan Clark & Sons, the famous telescope makers of Cambridgeport, Mass.

Struve came to this country, and intrusted to their skillful hands the making of the object glass, with a diameter of thirty inches, and its cell. The mounting of the great telescope is being made in Hamburg, Germany, by Messrs. Repsold & Sons. The Pulkowa object glass is four inches larger than that of the Washington telescope finished in 1873, and seven inches larger than that of the similar instrument recently completed for the Princeton Observatory, both telescopes being the work of the same makers. The arrangements with Messrs. Clark were made in the summer of 1881, and the great objective was completed in October, 1882.

A temporary equatorial stand was erected in the yard of the workshop, in order to test the quality, power, and perfection of the glass. It consists of a pier of solid masonry, to which a tube of sheet iron, made in three sections, is firmly fixed, with the necessary mountings to secure its movement in the required direction. The object glass, the eye pieces, and other appurtenances being then placed in position, the great refractor was ready to show its working power, and to reveal any slight imperfections in the polish or finish that required attention. The precious glass bore the testing process with triumphant success, and is pronounced by the makers to be the best that has left their hands.

But the supremacy of the Russian telescope as the largest of its kind in the world will be of short duration. The same trial mounting will be used by the Messrs. Clark for testing the thirty-six inch object glass which they have engaged to make for the Lick Observatory of California.

The pier of the temporary structure is twenty-seven feet in height; the tube is forty-five feet in length, with an aperture of forty inches in diameter. Figures, however, give a faint idea of this giant structure. It must be seen looming up under the sky before its huge dimensions can be realized. A view of the heavens through its great eye must be taken before its wondrous light-gathering power can be imagined.



THE TRIAL MOUNTING FOR THE GREAT RUSSIAN TELESCOPE, PULKOWA, RUSSIA. CONSTRUCTED BY MESSRS. ALVAN CLARK & SONS 1883.

The evening of our observation is intensely cold, but the sky is undimmed by the shadow of a cloud, the atmosphere is free from a breath of moisture. The heavens present a scene of exceeding beauty as the party of observers take their places under the stars. The last lingering rays of twilight faintly suffuse the west, the new moon, only a day old, holding the old moon in her arms, is nearing the horizon, and the zodiacal light spreads its cone of pale gold high up among the eternal stars. Under the dark dome arching above us, the brightest stars and clusters of stellar space look down with friendly eyes, and seem to hang low, as if they would hold communion with mortals. Among them thread the planets Jupiter and Saturn, whose mysterious portals we, audacious invaders, are seeking to enter this night with necromantic art. Rising from a surface of unbroken snow, and looming up with shadowy indistinctness, the huge telescope seems to pierce the skies, while the observers at its base dwindle to pygmies.

After a short time the instrument is ready for action; its open eye is turned upon the planet Saturn. The serene star, upon which a moment before we had turned our unaided eye, is suddenly transformed into a creation of surpassing beauty. A superb golden sphere, as large as the full moon, lies before us. Saturn is softly cradled in the protecting embrace of his engirdling rings, and seven of his eight moons are visible as bright points on the dark background of the sky. Titan, the largest moon, has a perceptible disk. Every detail of the magnificent and complex Saturnian system is complete. The outer ring, with its faint line of division; the division between the outer and inner rings; the inner or second ring; the third or crepe ring, closely joined to the second; the break on the rings formed by the shadow of the planet; and the soft markings on his disk. Nothing is wanting in the minutest details, and there is but one imperfection in the picture. The definition is not good; the outlines are not clearly defined. The view does not differ greatly in dimensions from that presented by a smaller telescope, but planet and rings are flooded with light of delicious brilliancy and softness. Here lies the advantage of a great telescope. It brings to the eye all the light that enters it, so that, within certain limits, the larger the telescope, the larger the amount of light it collects, the more easily visible will faint objects become, and the greater the number of objects before unseen that will be revealed.

The coloring is exquisite. Terrestrial colors are muddy in comparison

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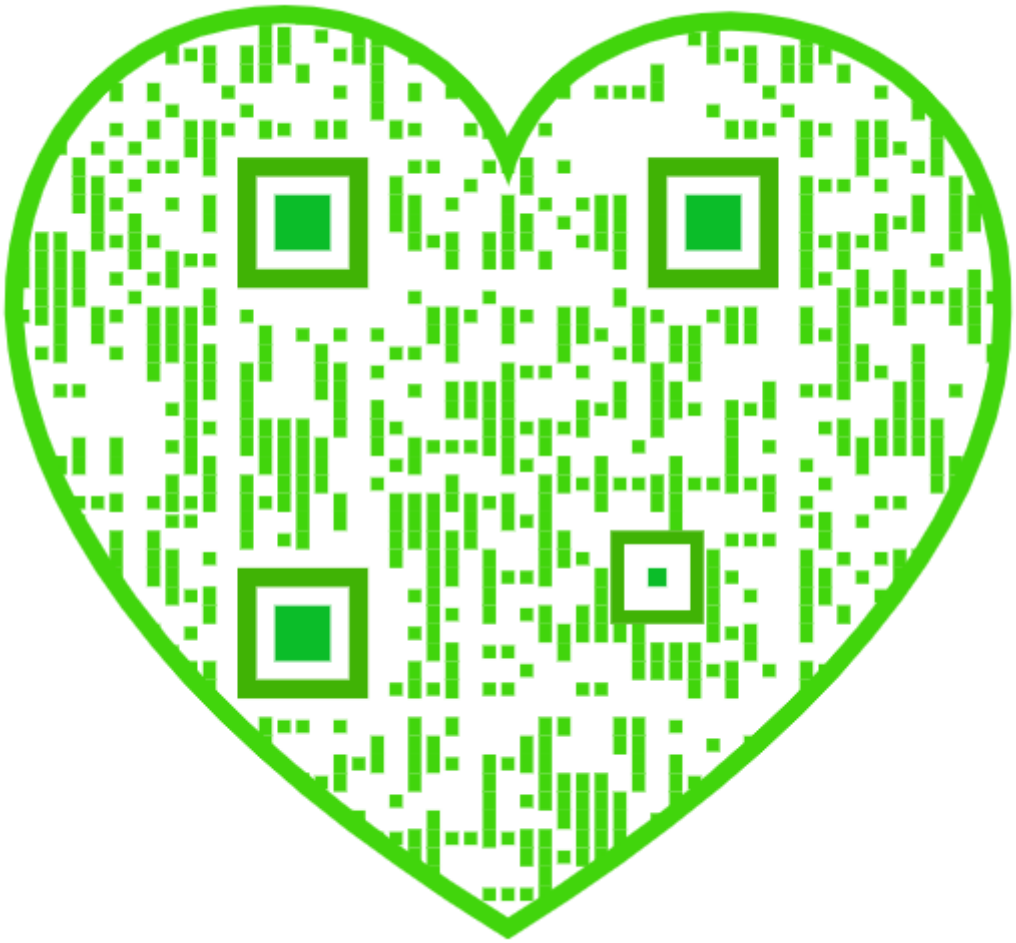

with the celestial hues of liquid gold of the disk and rings, and the creamy tints of the belts that cross the disk with the lightness and grace of scudding cloud bands. The sphere seems almost to stand upright within the encircling rings, only a small portion of the planet being seen beneath them. We have fallen upon favorable conditions for a view of Saturn, for his rings are opening to their widest extent, his northern declination is increasing, and he is approaching perihelion.

Jupiter is the next object to test the space annihilating power of the instrument. The Prince of Planets is superb, larger than the full moon, though but little larger than we have seen him many times in a telescope of eight inches aperture. He is, however, much brighter, and though by no means as magnificent as Saturn, we have the pleasure of feeling that we see him on a much larger scale. He seems so near that we are impelled to put our hands behind the glass and touch him. His broad belts are delicious in coloring, now suffused with pale rose, or mottled with soft gray, while shades of purple, brown, and delicate green are interspersed. Never before did we behold the variety of tone and tint, the flood of light we see this night. Never did our giant brother seem so near, so grand in proportions, so symmetrical in equipoise. His four satellites are brightly beaming on his left, and bear testimony to the power of the telescope by presenting disks instead of points. The famous red spot is wanting in the view. We mourn its absence, for, since 1878, its well known features have become as familiar and firmly fixed as if they were a permanent feature on the planet's disk.

What shall we see next? is the question now discussed, for the extreme cold has congealed the oil, and the monster refuses to move. His eye is turned to the meridian, and no effort will make him swerve one inch to the right or left. In this emergency, a member of the party volunteers to mount to the top of the pier and lubricate with fresh oil the joints of the giant. The plan is successful, and with many a shriek and groan, the lower end of the tube rises and the upper end falls, until the Cyclopean eye points to the great Nebula in Orion.

The little wisp of cloud haze visible to the naked eye is transformed into one of the most glorious visions that ever breaks upon the entranced eye of the observer. The most wonderful nebula the northern sky reveals lies before us, filling the whole field of view and suffused by a light that never was on sea or shore. Now we appreciate the power of the great telescope, the triumph of the optician's art. For definition is of little consequence in observing the shadowy nebula. Light is needed, and light comes.

The delicacy of the celestial glow that pervades the scene is beautiful beyond comparison. The central point of interest is the famous trapezium, consisting of four bright stars and two smaller ones. Around this sextuple group radiate what seem to be the head and branching horns of some huge animal, the trapezium occupying the open mouth, and surrounding a space of sky within which reigns the blackness of darkness. Spiral curves of nebulous haze fill in the field of view, the radiating mass being of a delicate green tint, while dotted over the shadowy haze are many brilliant stars, throwing an element of life into the formless void and helping to light up this scene of loveliness and grandeur which no pencil may paint nor pen describe. We feel, while with reverent eyes we gaze upon the picture, that we are looking within the eternal gates, and enjoying a glimpse of the glory to be revealed, that "eye hath not seen or ear heard."

It is said that no one can look upon the Apollo without standing erect and feeling a sense of the divinity inherent in human nature. But what is this masterpiece of Greek art, chiseled by human hands from a block of marble in comparison with this creation from Nature's fashioning hand brought near to mortal eyes by telescopic art! Where but in the heavens shall we find such an exhibition of majesty, vastness, and celestial grace as is symbolized in the great Nebula of Orion, beaming with suns, peopled with ghostly shadows, and glowing with light that is hundreds of years when it reaches us! Our earth and her brother planets will have cooled down to dead worlds, the sun's fires will be quenched in utter darkness, when the star dust on which we are now looking will quicken with the pulse of physical life, throw off its concentric rings, and concentrate into beaming suns and systems to take the place of those whose race is run, whose mission is fulfilled.

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THE TOTAL SOLAR ECLIPSE OF MAY 6.

A total eclipse of the sun occurs on the 6th of May, that presents features of special interest. It is greatly to be regretted that this sublime and awe-inspiring phenomenon marks its path over a portion of the globe where there are so few to witness it. The line of totality lies entirely in the South Pacific Ocean, and as ingeniously avoids habitable land as if its purpose were to confine the spectacle to the smallest possible number of spectators.

There are, however, within the narrow path of total obscuration, two eligible points where the eclipse may be seen to great advantage. These points are two small islands, named Caroline Island and Flint Island. Caroline Island, the larger of the two, is about ten miles in circumference, and was, when visited in 1874, inhabited by a few natives and an Englishman. It is situated in 73° 20′ west longitude from Washington, and in 9° 40′ south latitude. It does not belong to the group known as the Caroline Islands, situated farther west. The duration of totality in Caroline Island will be five minutes twenty seconds.

Flint Island is five or six miles in circumference and is uninhabited. It is situated in 73° 40′ west longitude from Washington, and in 11° 30′ south latitude. The advantage it possesses lies in the fact that the totality here continues five minutes and thirty-three seconds, thirteen seconds longer than in Caroline Island.

The eclipse of May next is especially favorable to observation on account of the exceptionally long duration of the total phase. The longest time a total solar eclipse can last is a little less than seven minutes. The average time is about two minutes. In the present case, the totality will continue between five and six minutes, which is a rare event.

Three expeditions are already on the way to these lone islands of the Pacific, for the purpose of observing the eclipse. The American expedition is sent by the United States Government, five thousand dollars having been appropriated for the purpose. The National Academy of Sciences, the Naval Observatory, and the Coast Survey all send representatives. The party consists of six members. Prof. Holden, Director of the Washburn Observatory, at Madison, Wis.; Prof. Hastings, of the Johns Hopkins University, of Baltimore, and Mr. Rockwell, of Tarrytown, New York, nominated by the National Academy of Sciences; Mr. Preston and Mr. Upton, sent by the Coast Survey; and Ensign Brown, sent by the Naval Observatory. Prof. Holden has charge of the expedition.

The astronomers started from New York on the 1st of March, reached Panama on the 9th, and Callao on the 22d. From Callao they will be conveyed by a government steamer directly to Caroline Island, which they hope to reach by the 25th of April. They will spend the intervening time till May 6th in preparation for their work. After the eclipse, the government steamer will take the voyagers to Honolulu, Sandwich Islands; thence they will return by steamer to San Francisco, and arrive in New York about the 1st of July. This is the programme of the American exploring party, and on account of the isolation of its members from the rest of the world it will be impossible to obtain tidings of the result of their work before the 1st of June.

British astronomers are but meagerly represented on the occasion. The Royal Astronomical Society has sent two representatives, who, joining the American observers at Panama, will go with them to Caroline Island. They will take charge of the photographic work.

The French expedition, under the charge of M. Jannsen, is also on its way in pursuit of the same object. It will probably observe on Flint Island, or, divided into sections, may occupy both islands.

Thus, three of the most enlightened governments of the world send men of science to this far-away spot to "take notes" on the day when the light of the sun is hidden for less than six minutes. What do these astronomers hope to accomplish that will reward them for the privations endured in traversing many thousand miles by land and sea, and for the possibility that intervening clouds may hide the grand phenomenon from view?

They hope to learn something on three important points, two of which are connected with the surroundings of the sun, and are never revealed except on the rare occasions of a total eclipse. In the first place, they will make a study of the corona, the silvery halo that surrounds the sun, and comes into view the moment his bright orb is covered by the moon. Especially will they pay attention to the immense appendages that branch out from the corona in all directions, and, taking on all manner of fantastic forms, spread in limitless dimensions into the regions of space. The problem of exceeding interest to solve is whether they are dependencies of the coronal atmosphere, or whether they are swarms of meteors circulating around the sun.

In the second place, observations will be made upon the zodiacal light, the glimmering glow of pale gold that, during portions of the year, appears in the west after sunset, and, assuming a cone-like form, rises high among the stars. The possible connection between this mysterious light and the coronal appendages affords material for observation of exceeding interest.

In the third place, careful search will be made for the small intra-Mercurial planets that probably circulate in the immediate neighborhood of the sun, and can only be seen when making a transit over his disk, or during a total solar eclipse.

Observations on various other points of interest connected

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with the sun and the corona will be made during the six precious minutes of veiled sunlight. The contacts will be carefully noted for the correction of the lunar tables; the corona and its spectrum will be accurately photographed; the chromosphere will be examined with the spectroscope both before and after totality; a new polariscope will be tried; and meteorological instruments will be used for studying radiation and other phenomena.

The tropical locality of the place of observation is favorable for clear weather on the momentous occasion. There is every reason to anticipate that discoveries will be made and observations confirmed that will increase our knowledge of the solar surroundings and reflect great honor on the astronomers who braved the dangers of the deep to wrest from the eclipsed sun a few of the secrets at all other times securely hidden beneath the dazzling brightness of his beams.

ENGLISH NAIL MAKERS AND THEIR WRETCHEDNESS.

Those who are so apt to jump at the conclusion in the abstract that machinery and invention throw manual labor out of employment, and so encourage pauperism, would do well to take a lesson from some of the industries which are carried on by hand work, and study the phases which they present One of these pictures, which quite eclipses the "Song of the Shirt" for squalor and wretchedness, has just been drawn by Mr. Robert P. Porter, in the *Tribune*. Mr. Porter was a member of the late Tariff Commission, and is clearly a close observer of matters concerning industrial labor. From his last letter we gather the following:

The country which Mr. Porter visited was the "Lye Waste" region in the Back Country—a district located partly in Stafford and partly in Worcester, England. In this district, situated seven miles from the great manufacturing industries of Birmingham, and dismal beyond description, is to be found an army of 24,000 persons engaged in making nails and rivets by hand. A place where only wreck and ruin, squalor, filth, and wretchedness abound, it is yet peopled by some of the most industrious people in England. The work of nail and rivet making is done in little smithies attached to the hovels, which are filthy and horrible beyond description. The father, mother, and children all engage in the industry, while the wages of two parents and a daughter, say of fourteen, are barely sufficient to keep the family from starving. Mr. Porter puts it in this wise: An expert nailer, working steadily from Monday morning to Friday night, can only make two and a half bundles of iron rods into nails, for which he gets 6s. 7½d. per bundle, or for his week's work, 16s. 8d., exactly $4. Now, his wife, by working every moment of her spare time and late into the night—neglecting the wretched little children—can make a bundle of commoner nails, for which she is paid 3s. 1d., and the little half-starved, stunted girl of twelve, with her brown arms and steady, unerring aim, will hammer out half a bundle, 1s. 6½d. Total earnings of an industrious and hard working family, three at the forge, for the entire week:

	English money.	*United States money.*
Father	16s. 8d.	$4 00
Mother	3s. 1d.	74
Daughter	1s. 7½d.	39
Total gross earnings of the family per week	21s. 4½d.	$5 13

But out of this pittance must come 3d. for carriage of iron from the "fogger's" and returning the nails, 1s. for the smithy fire, and 3d. for the wear of tools. Net earnings, $4.77 per week—the united earnings of three industrious, sober persons.

The saddest feature of this business is that the young women should be allowed to work at the machines called "alives," heavy machines made of iron and working with a treadle, employed in flattening the heads of the large eight-inch bolts. Hundreds of women work at these machines, and do not earn over $1.25 a week, and this work has been done in this way for a century. The poor operatives scarcely have an additional comfort over what was obtainable a hundred years ago.

The effect of such work and such surroundings upon the morals of the community are what might be expected. We have no reason to believe the picture at all overdrawn which describes the young women as living most wretchedly. Not only do they marry early—several girls not over seventeen being pointed out to Mr. Porter as mothers of children two and three years of age—but the London *Standard* tells a story appalling for its wretchedness. According to that journal, "women within a few days of their confinement have been known to work in the agony of exhaustion, in order to earn a few pence at the 'hearth'—not the 'hearth' of home, but the hearth of the 'forge'; they have been known to return to work in a day or two after childbirth, emaciated in constitution, weak and weary for the want of simple nourishment. Their children, ragged and ill fed, have had to lead miserable and wretched lives, with no hope before them but a life of wickedness and vice."

It goes without saying that the remedy for such a state of slavery is emigration. The United States may not be a paradise where gold grows in the streets and diamonds crystallize on trees; but it at least is a country where such squalor and wretchedness are comparatively unknown. And in this condition of affairs as is here described some of our large manufactories may find a hint for their supply, and no form of philanthropy could convey the spirit of a truer beneficence than that which should lift such a people out of their squalor, and surround them by the comforts, the earnings, and, we may add, leisure as well, which are to be met with in so many of the industrial towns of the United States.

HOT AIR FOR BOILER FURNACES.

The use of *hot air* for feeding the furnaces of boilers for generating steam where the heating of air is accomplished by conserving the heat of the waste products of combustion, and also the exhaust steam from engines and other sources, has been applied with much profit and satisfaction in a large establishment in this city, where its adoption has resulted in a decided saving in the consumption of coal, as indicated by an evaporating power of seventeen pounds of water to the pound of coal. In addition to this, one of the serious troubles and sources of waste in the ordinary methods of firing, viz., the slicing and cleaning of fires, is avoided. In this case it is done only at the end of the day.

In this apparatus, the draught power of the great chimney is alone sufficient to overcome the friction of the air in passing over the large surfaces of the heaters.

The first increment of heat is received by the air from a large surface condenser, into which the exhaust steam from the various engines and other appliances is discharged.

The temperature of the air after leaving the condenser ranges from 150° to 175°, varying with the temperature of the external air.

It then enters the pipes of a flue heater, consisting of a chamber placed between the boiler and the chimney and crossed by a large number of thin cast iron pipes arranged in sections, so that the air enters at the end next to the chimney, or coolest end of the heater, and emerges at the end next to the boiler, or hottest end; where the temperature as observed by a pyrometer, is found to be from 375° to 400° Fahr., at which temperature the air is drawn beneath the grate bars.

At several places, or between the doors, are inserted in the boiler setting a number of pipes with dampers, connecting the ash pit with the fire chamber, so that a part of the hot air, as regulated by the dampers, can be thrown into the fire chamber for perfecting the combustion of the gases.

The pressure carried in this boiler, which is of peculiar construction, is 110 pounds per square inch.

The appearance of the pea coal upon the grate, and the combustion of the gases, as observed through the peep holes, are highly characteristic of this system.

The coal appears of a dull red color, while the activity in the motion of the gases in the combustion chamber is remarkable.

In this condition of the fire, no clinker is made, while the coal seems to be partially vaporized, and the combustion completed above its surface.

The coal is fed in in the usual way, at intervals of one-half to three-quarters of an hour, in thin sheets; the grate carrying at no time a greater depth than six inches.

At the end of the day's firing the coal is allowed to burn down, when the fire is hauled from the grate, a new fire being built every morning.

No clinkers are found in the ashes and debris hauled from the grate; the fire bed does not become hot enough to form clinker.

In trials made by alternating a cold draught with the hot air draught, some similar effects were noticed. Upon closing the damper of the hot draught inlet, and also the dampers of the fire chamber connections, and opening the ash pit doors, so as to give the fires a cold draught as in ordinary boiler furnaces, the coal began to brighten and finally became white hot within the mass.

The volume of flame in the combustion chamber decreased; the pressure fell in a short time from 110 pounds to 90 pounds, showing very vividly that the combustion was going on within the coal bed instead of above it. In a short time the fires began to clinker, and recourse was had to dressing and cleaning the fires. This, on a grate of about 160 square feet with eight doors, was no light work.

The experiments seem to have fully confirmed the value of the hot air draught, and to finally establish it as an improvement parallel with the hot blast in the iron furnace.

It has been in constant use for several years. Its only objection seems to be the large cost of the heaters.

SWEARING BY TELEPHONE.

A quite practical question from an ethical point of view has just been decided, involving the morality of the telephone—whether one using its facilities is entitled to prostitute them to the furtherance of profanity; in other words, is a man entitled to swear by telephone, and will the courts protect him in the use of the telephone for that purpose? A case involving this issue came up recently in an Ohio town, where a party who used the telephone was addicted to the use of profane expressions in his communications.

He was repeatedly requested to cease his profanity, but refused. Then the company attempted to take the instrument away, and suit was brought to prevent them from doing so. The company had a rule prohibiting the use of "improper or vulgar language" in telephonic communications; and under this regulation they rested their right to remove the instrument. After hearing argument the court held that the company's claim was good, and that they had an unquestioned right to remove the instrument. In rendering his decision the judge said: "The telephone reaches into many family circles; and it must be remembered that it is possible, from the peculiar arrangement of the instrument, that a communication intended for one individual shall reach another. All communications should therefore be in proper language. Moreover, in many cases the operators in the exchanges are refined ladies, and, even beyond this, all operators should be protected from insult." And so that instrument was removed and that swearer's profanity is not to be spread over the country by electricity. Probably good law, and undoubtedly good morals.

A New System of Treating Fecal Matter.

At a recent meeting of the Society of Engineers, London, a paper was read by Mr. Harry Olrick on the above subject, of which the following is an abstract: The almost universal system of water home sewage adopted when a city is near a river has given rise to a very grave inquiry as to whether this should not give place to some other method of disposal and utilization, which will not pollute the rivers. The pail system, apart from a sentimental view of the case, seems to work well in such towns as Manchester, Birmingham, Warrington, Rochdale, and others, the board of health of Manchester claiming that since the adoption of this system the cases of zymotic diseases have greatly decreased. They, like numerous other towns, are making manure out of fecal matter, besides treating and utilizing the other large amount of refuse, and although doing a considerable amount of work which does not produce revenue, they are not only self sustaining, but work at a profit. The new system which the author calls particular attention to has been worked out by Baron De Podewils, of Munchen, and is claimed to be an improvement on other systems, from the facts that the operations of the factory are comparatively automatic, that no unpleasant odor can arise, since the operations are all performed in closed vessels, that by a system of quadruple evaporation the fuel necessary is reduced to a minimum, and the resultant manure is of high quality, and is sold at from £9 to £10 per ton.

A factory has been erected by the Baron at Augsburg, in Bavaria, which is designed to deal with the excrement of about 17,000 inhabitants, or about 7,000 cubic meters per annum. The fecal matters are deposited in air-tight tanks, the gases generated being drawn under the steam boiler and burned. From these tanks the matter is drawn into a mixer provided with revolving arms, where a proportion of sulphuric acid is added; the effect of this is to generate carbonic acid and other gases which are conveyed away to be burned. From the mixer the fecal matter is forced into a fumigating pan; this pan is provided with hollow revolving arms which curve down to the bottom of the pan. Part of the products of combustion from the steam boiler are induced through the fecal matter by way of the hollow arms, and pass away, together with the gases generated, through an exhauster to the furnace of the boiler. From the fumigator a *monte-jus* forces the matter into a series of four evaporators, the vapors of one serving to evaporate the moisture from the next at a lower temperature and below atmospheric pressure, thus saving 75 per cent of the fuel ordinarily required to produce the same result. These evaporators have a temperature varying from 140° to 248° Fahr. From the evaporators the *monte-jus* forces the by this time pasty mass into a tank provided with a bucket wheel. This tank is placed above the final drying machine, which accomplishes the most difficult part of the whole process, viz., evaporating the remainder of the 95 per cent of moisture originally contained in the fecal matter, when it has reached a peculiarly tenacious and sticky stage. This machine consists of steam jacketed ring-shaped plates, on which the pulp is thinly spread by means of a rotating spout attached to a revolving hollow spindle, which conveys the pulp from the overhead tank fed by the bucket wheel.

After this layer has remained on the plate a few minutes it is scraped off by knives, also attached to the revolving spindle, and drops into a chute, whence it passes, by means of an elevator, into a disintegrator. This is the end of the process, a manure being produced in the shape of powder containing less than 9 per cent of moisture, 8 to 10 per cent of nitrogen, 3 to 4 per cent of alkalies, and 3 to 4 per cent of phosphoric acid, and consequently worth now as much as imported guano. This factory has been in operation nearly three years, and although laboring under the disadvantage of having to use coal as fuel at 23s. per ton, the proprietor has been able to make 20 per cent dividends. Another factory has been erected at Stuttgart with equally good results. At Augsburg a pail system is in use. At Stuttgart the cesspool is general. The author calculates that with a population such as England possesses, manure weighing 600,000 tons, and of a low estimated value of £4,000,000, is annually allowed to poison the air and water, instead of being permitted to return to the soil as Nature intended.

Another Fast Ocean Steamer.

The Fulda is the name of a new ship lately built in Scotland for service between New York and Bremen. She is a magnificent vessel of 5,124 tons gross, built by John Elder & Co., of Glasgow. The vessel lately went on a run extending over six hours, the trip being prolonged from Cumbrae Light to Corsewall Light, beyond the mouth of Loch Ryan, and back again. Over that great stretch of sea, and the time mentioned with the tide against her both ways, she attained, says *Engineering*, the extraordinary speed of 17·803 knots, or upward of 20¾ statute miles per hour, a speed which has never yet been exceeded by any other great ocean steamer, with the exception of the Alaska and the Stirling, which were also built in Fairfield Shipyard.

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SIDE SHOW SCIENCE.

Those talking decapitated persons that are so often seen in various kinds of shows are one of the sights that always prove equally successful. They have already astonished a number of generations past, and will probably prove just as attractive to those that shall succeed our own.

These decapitated persons are seen under different aspects according to the tricks employed to produce the illusion, and which all have the same aim in view, that is, to cause the appearance, on a table or tray, of a living head with no visible body. This illusion may be produced in several ways. At the Foire aux Pains d'Epices of 1880, one of the side shows exhibited a decapitated person as follows: The small stage, which was draped with a black fabric covered with silver spangles, was feebly lighted by a sort of night lamp attached to the ceiling. To the right and left were seen panoplies of skulls and cross-bones. The spectators were in darkness. In the middle of this grim place a tray was suspended by three small chains at about three feet from the floor, and upon this tray there was a living head—that of a young man who an instant before had shown himself to the public. His body lay extended out under the tray, and his head talked, drank, and smoked, while his arms and legs moved. Both, although quite distinct, were perfectly alive.

The trick by which the illusion was obtained consisted in this: The body belonging to the apparently decapitated head was hidden behind, under the tray, and was completely invisible owing to the shadow of the latter, and the partial darkness of the stage. The apparent body was that of another person of exactly the same height, size, and dress, whose head was in the dark and further hidden by black cloth.

Fig. 1.—EXPLANATORY OF THE TALKING HEAD.

Fig. 2.—EXPLANATORY OF THE HALF-WOMAN.

At present there is being exhibited at Paris, in what is called the "Théatre des Merveilles," another example of a decapitated person. A young girl first appears before the audience, accompanied by an executioner clad in red and armed with the traditional ax. Then the curtain drops, but rises in a few moments, and shows the stage a little darkened. Near the executioner, however, can be perfectly distinguished the girl's head lying on a round table at the back of the stage; her body is seen lying on a bed at a few feet from her head, and at her side is the fatal block that has served for the execution. The effect is dramatic. The trick employed is the same as the preceding, in that it requires two persons of the same size wearing the same costume. One of these—the one who showed herself to the public—makes the head, her body being hidden behind the cloth in the rear of the stage. The other, who makes the body, has her head bent far back and hidden in a sort of box, a false cardboard neck contributing to increase the illusion. Other processes, which in our opinion are more interesting, are those obtained by the aid of mirrors. We shall now speak of an example that may frequently be seen at fetes in the suburbs.

Upon entering the little booth we perceive a black wooden table having four legs. Over one of its angles there is thrown a piece of red fabric whose other end may be perfectly seen hanging from the opposite side. The floor, which is strewn with straw, is continuous to the back of the stage. There is nothing under the table, then—there can be no doubt of it. Still, upon this table there lies on a tray the head of a young girl which smiles and answers questions that are asked it. The ingenuous spectators are almost persuaded that the girl has no body; others ask themselves where it is hidden; and very peculiar suppositions are indulged in on all sides. In a word, the illusion is perfect.

When, through favor or money, we enter the side scene and look at the table sideways (Fig. 1), we are almost ashamed of having allowed ourselves to be deceived by so simple a trick; for the apparatus consists, in fact, only of a mirror fixed to the two side legs of the table. This mirror hides the body of the girl, who is on her knees or seated on a small stool, and reflects the straw which covers the floor so as to make it appear continuous under the table, and likewise reflects the front leg of the table so as to make it appear at an equal distance from the other side and thus produce the illusion of a fourth leg. It also reflects the end of the red fabric hanging in front of the table, and thus makes it appear to hang down also from behind. It should be remarked that during the exhibition the spectator stands only a few inches away from the table and head, being separated therefrom by a wooden railing from which hangs a curtain reaching to the ground. Such proximity of the spectator and actor would seem to favor a discovery of the trick; but, on the contrary, it is indispensable to its success.

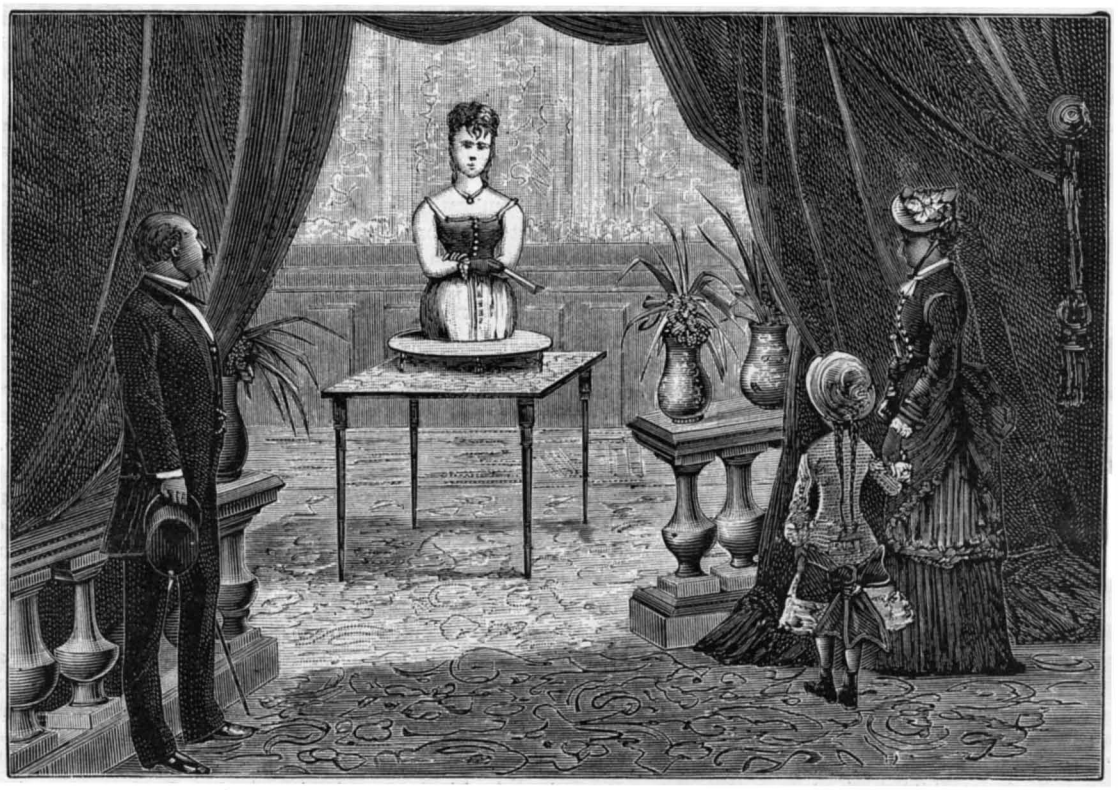
Were the spectator placed at a distance, and did the curtain not exist, he might by stooping see his legs reflected in the mirror. The curtain, then, prevents any one from looking under the railing, and the rays that might reach him from the curtain, by being reflected in the glass, are lost beneath the table, owing to the proximity of the latter.

As may be seen, the trick is easily understood, and, moreover, it is one of those that gives the best results, since it deceives the public the best. Besides, it has the merit of age, for it may almost be said that it has existed from all times. In the seventeenth and eighteenth centuries it was one of the successes of the St. Germain Fair. It is one of those side show curiosities that may almost be qualified, without contradiction, as *classic.*

The Living Half-Woman.—The living half-woman is a very ingenious improvement on the decapitated individual, and exhibits the peculiarity of being unique, for there is but one example of the kind in France. This mode of illusion is carried on by its inventor, who is making all the capital possible out of it. The booth in which it is exhibited is of small dimensions, and its front is covered by a canvas representing a woman possessing only the upper portion of a body, placed on a table and surrounded apparently by physicians who are examining her with interest.

If we allow ourselves to be persuaded to enter, we perceive, when the curtain is drawn aside, an elegant little room decorated with flowers and lights and hung with curtains and tapestry. In front there are two railings, and the floor is covered with a carpet. In the center is seen a small table, on which rests a sort of three-legged stool supporting a cushion and the half body. The latter is the body of a young woman apparently cut in two just beneath the thighs. Naturally, this young person shows that she is alive by moving her arms and head, and speaking and singing. Now, as we can see the four legs of the table and can perfectly distinguish the space under the stool, and that too in full light, we naturally ask by what means the lower part of the girl's body is hidden. The showman comes to the rescue, and announces at the end of each representation that those who desire to know the secret of the half-woman may remain at a private seance for a trifling additional sum. It should be remarked that a very small number of the ordinary patrons of fairs will consent to give a franc or fifty centimes to satisfy their curiosity; and the majority of them are content to make more or less strange suppositions. The private seance, however, is very interesting, The showman first descants on the accumulation of difficulties that had to be conquered to produce the illusion, and then, at a sign from him, the girl raises the stool and shows that it is formed only of a hollowed out disk whose supports are connected by two mirrors, that make with each other an angle of 45 degrees. These mirrors rest on the top of the table, which is decorated with regular designs in mosaic, and reflect the latter in such a way that they seem to continue uninterruptedly under the stool. The table presents an analogous arrangement, its side legs being connected with the middle one by two mirrors (Fig. 2). These mirrors reflect not only the designs of the carpet, which by their continuity produce the illusion of a vacancy, but also two table legs located on each side behind the railings. The mirror to the left transmits to the spectators on that side the image of the leg placed on the left, and this image seems to them to be the fourth leg of the table. The mirror to the right plays the same role with regard to the spectators on that side. These mirrors, in addition, hide the lower portion of the girl's body.

Such is the secret of the living half-woman as represented in the accompanying Fig. 3. The principle upon which the effects above described are based has been utilized in several fairy scenes. Thus there may have been recently seen in *Madame le Diable,* at the Renaissance, an analogous trick, and, as with those just explained, the means by which it was performed greatly puzzled the majority of the spectators.—*La Nature.*



SCIENTIFIC ILLUSIONS.—THE LIVING HALF OF A WOMAN.

Gas for Nothing.

Scientific prophets have foretold that a day will come when the "residual products" resulting from distilling coal will be so valuable as to reduce the price of gas to a mere nothing. That good time has not arrived, it must be confessed, but if we may believe the confident assertions of a gentlemen at Chester, there is already in existence an appliance which goes a long way toward fulfilling these predictions. He claims to know a peculiar description of oven for making coke which, without the help of a high chimney, enables those who use it to drive steam engines without any expense for fuel. Every ton of coal consumed in the oven yields coke worth 7s., and tar and ammonia worth 4s., in addition to 14,000 feet of gas. If, therefore, says the London *Globe,* the first two products are sold, the price—11s.—more than pays for the slack coal from which they were derived, as well as for labor, wear and tear, and interest on the capital sunk in plant.

The manufacturer consequently gets 14,000 feet of gas for nothing from every ton of coal subjected to the process, and this he can use instead of fuel to generate steam. It is certainly a bold claim to put forward, but it may, perhaps, be justified by the present prices of coke, ammonia, and tar. If, however, these ovens come into general use, the market value of such products will assuredly fall heavily in proportion to the immense enhancement of supply, and in that case the prices fetched would not cover the cost of materials and labor.

Rapid Formation of Mineral Veins.

Dr. Fleitmann has lately remarked that the formation of mineral veins is far from requiring the length of time generally supposed to be necessary. About two years ago he filled up a trench with common clay containing iron, and having occasion to again clear this trench he found, to his great surprise, that the clay had entirely changed its character and had become white; while at the same time it was traversed in several directions by fissures one-twenty-fifth to one-sixteenth of an inch thick, which were filled with compact iron pyrites. Dr. Fleitmann supposes that the oxide of iron contained in the clay, coming in contact with water impregnated with sulphate of ammonia, became transformed into sulphate of iron.

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ORNAMENTAL ENTRANCE GATE.

Our engraving shows an ornamental carriage gate, built by the Coalbrookdale Company, after designs prepared by Mr. Maurice B. Adams, A.R.I.B.A. The gate is of cast iron, and alike on both sides.

Incombustible Houses.

The architect to the municipality of Verdun, M. P. Chevenier, has contributed to the *Genie Civil* a paper on the incombustibility of buildings, which, although more particularly relating to the large Continental house containing *appartements* on the several floors, nevertheless gives some general advice for the arrangement of buildings, so as to prevent fires from attaining unmanageable proportions. He is of opinion that, until preparations for rendering materials incombustible have stood the test of time, their use should only be resorted to by way of additional precaution, while the buildings themselves should be so constructed that any fire which may happen to break out would be confined within very narrow limits.

The piers that support the principal parts of the structure should be built of such materials as stand heat well without appreciable alteration of form; and preference is given to sandstone, millstone, grit, flint, and granite, the joints being made with argillaceous cements like those of Portland. The main portions of the internal walls should be built of similar materials, or, at any rate, faced with them. As regards the exterior, it will be sufficient to face the lintels and allaying of the windows, which are specially liable to be licked by flames.

Indeed, as a rule, the framework of all openings, both in the interior and exterior, is more exposed than the intermediate portions, and should therefore be better protected. When, on account of the design, the walls of the facades cannot be well stayed with masonry, they should be tied by iron rods let into the floors, or by anchors attached to the ends of the main girders. In this manner, walls standing alone for a great height are prevented from twisting, and are exposed to the action of the heat on one of their faces only.

The best way to insure the stability of a building under the influence of fire is to keep the floors from giving way. This is easy enough when they are of iron and pugging, but requires special precautions when they are made of combustible materials. MM. Flachat and Noisette have come to the conclusion that a half inch layer of asphalt over an inch of argillaceous earth is sufficient to protect a floor, both at top and bottom, in the event of a fire occurring; and this system is carried out at the fodder lofts of the Paris General Omnibus Company. A layer of plaster of Paris, fine concrete, cement, or clay, 3 or 4 millimeters—0 11 to 0·15 inch thick—or a paving of tiles, permits of waiting for assistance, by preventing the air from coming in contact with the wood, and thus maintaining combustion.

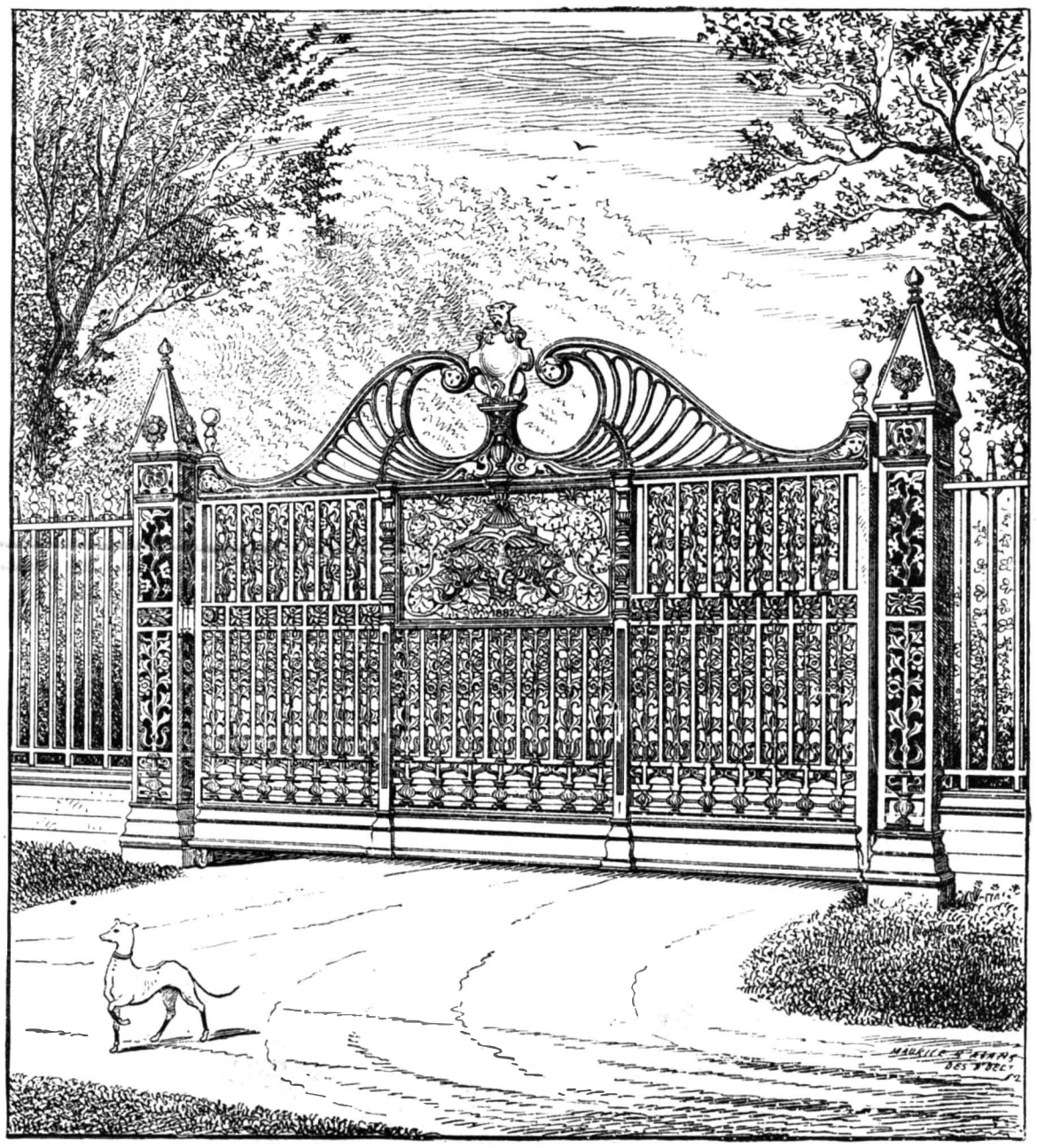
The ceilings should be thick and laid on wire gauze, to the exclusion of laths; and channels in them should be botched with clay, small twigs, and chopped hay. Similar precautions should be taken with the roofs between the rafters, thus insuring tightness, a conservation of heat, and a diminution of danger from fire. The simplest arrangement consists of a rough ceiling of plaster and argillaceous sand on wire gauze nailed under the rafters, and a planking with closed joints under the roofing proper, which should be incombustible, and consist of slates, tiles, or sheet metal.

In the case of iron floors being adopted, the parquetry should be laid on pitch or cement; and special precautions should naturally be taken with the grates and chimneys.

As the floors are supposed to be incombustible, the fire can only extend from story to story by the staircase, which must, therefore, be isolated from the rest of the building. The well should be surrounded by thick walls capable of arresting the flames; and the landings should be flagged and arched or constructed of iron and concrete. The notch board may be of iron or stone, and the steps of cast iron and tiles, or even of wood set in cement. In this latter case, the wood does not easily catch fire, as the air can only get to the upper surface. There should be incombustible and almost hermetically tight appliances for closing all openings from the several landings. Thus doors of thin sheet iron with wrought iron frames may be employed; or the doors may consist of two faces of woodwork with a sheet of iron between. The top of the well should be closed in by wrought iron and bricks that stand the fire well; and the staircase windows should be made incombustible by means of metal frames and mica panes.

The outside windows of the edifice may be provided with Venetian blinds of iron, rolling blinds of wire gauze, or iron shutters, to be closed in the event of danger threatening. To prevent the fire from spreading by the roof, it will be broken by transverse gables at intervals; and the use of combustible materials in all projecting ornamentation is to be avoided.

In conclusion, M. Chevenier does not consider it indispensable that all the materials of a house should be incombustible or non-inflammable, but he contends that the carcass of the house should be built in such a manner as to localize the fire; and, to insure this, it will be sufficient to adopt the measures named above. This does not prevent the use of materials, such as the roofing timber, for instance, from being rendered incombustible by any of the various processes for this purpose.



SUGGESTIONS IN DECORATIVE ART.—ORNAMENTAL CAST IRON GATEWAY.

Learning a Trade.

Referring to the inauguration of a class in the science of plumbing, under the auspices of the Metropolitan Museum of Art, in this city, a correspondent of the Philadelphia *Record* says: "If this will diminish the number of young men whose highest ambition seems to be to stand behind the counter and wear good clothes, it will be a public benefaction. There is a great deal of money in trades and very little in counter jumping, and yet only one young man in a hundred is willing to blacken his hands with tools. It is not always the boy's fault, however. A gentleman of my acquaintance, who is a broker in Exchange Place, said to me recently: 'I ought to have been a machinist; I would have been rich by this time. When I was a boy I wanted to go into the Allaire Works, but my father was afraid it would soil my hands. He wanted me to be a gentleman. The result is that I have never liked my business, and never made more than a living at it. Had he let me go in as an apprentice in the machinist trade, I would have been building engines and coining money by this time, and my whole heart would have been in it.' The fathers of to-day in New York are the same. They would almost as soon bury their sons as make them apprentices. The result is a race of mediocre clerks and book keepers, who find their intellectual level in the flash newspapers of the day."

Electrolytic Studies.

Bartoli and Papassogli have devoted much time to the study of the effect of electrolysis upon different substances. They subjected a large number of binary compounds, also acids and salt solutions, to the action of an electric current, using carbon poles. Their results are thus summarized in the *Gazzetta Chim. Ital.*

1. In those liquids in which no electrolytic oxygen is evolved at the anode, the carbon that forms the positive pole is not perceptibly consumed. One exception to this was hydrofluoric acid, in which the gas carbon used as positive electrode was rapidly consumed.

2. In those liquids in which free oxygen was liberated by electrolysis at the positive pole, this pole was rapidly destroyed when made of gas carbon, as well as those of wood charcoal and graphite. Anhydrous carbonic acid (CO_2), carbonic oxide (CO), and other gases were evolved, according to the carbon used.

3. When graphite was used, the liquid did not change color; gas carbon and wood charcoal (purified by heating in a current of chlorine) gave an intense color in alkaline solutions, and also in the solutions of a few acids and salts. [It is known that the electrolysis of caustic alkali, using cast iron poles, gives an intensely deep red solution.—TRANS.]

4. If gas carbon or wood charcoal is used for the positive electrode in acid and neutral solutions, where oxygen is given out at the anode, there is formed in addition to carbon monoxide and dioxide (CO and CO_2) a solid black substance called *Mellogen* ($C_{11}H_2O_4$), and only traces of benzo-carbonic acid. In the solutions of phosphoric acid, hydrofluoric acid, or potassium antimoniate, a substance is obtained resembling mellogen, but containing either phosphorus, or fluorine, or antimony.

On the other hand, when graphite is used for positive electrode, there is formed, besides the carbonic acid and oxide, chiefly graphitic acid ($C_{11}H_4O_5$), or some similar substance containing, as before, phosphorus, fluorine, or antimony, respectively.

5. In alkaline solutions using gas carbon, wood charcoal, or graphite for positive electrode, they obtained mellitic acid ($C_{12}H_6O_{12}$), pyromellitic acid ($C_{10}H_6O_8$), hydromellitic acid ($C_{12}H_{12}O_{12}$), and hydropyromellitic acid ($C_{10}H_{10}O_8$).

A Seed Tester.

A correspondent in the *Farm and Fireside* gives the following directions for testing the quality of seeds.

My plan, he says, is to make a box about six inches deep. Fill in four inches of good soil; on this lay a thin piece of muslin, just enough to fit the box, and make it nicely level on the soil. On this muslin put one hundred seeds of the kind you wish to test. Cover them with another piece of muslin, and an inch of earth. When done, water with slightly warm water and set away in a warm place. The sprouting process can be much facilitated by placing the box on the stove, daily, after the fire is nearly out, so that the stove is just warm enough to heat the bottom of the box. Otherwise the box can be set on bricks that are heated daily for the purpose. After four or five days lift off the top dirt and its covering of cloth carefully. Count the seeds that have sprouted, and if only fifty of each sort have sprouted, procure new seed. If over seventy-five are sprouted, and the sprouts all look vigorous, the seed will do very well. Of course, the greater the per cent of those that sprout, the better.

A Scientific Centenarian.

Perhaps never in the history of science, says the *Lancet*, has a distinguished career equaled in its length that of M. Chevreul, whose name is best known in connection with his investigations on color; and it is probably altogether unique for a *savant* to be able, at one of the most distinguished scientific societies in the world, to refer to remarks which he made before the same society more than seventy years previously. A few days ago M. Chevreul made a communication to the Académie des Sciences, and at its close he observed: "Moreover, gentlemen, the observation is not a new one to me. I had the honor to mention it here, at the meeting of the Académie des Sciences, on the 10th of May, 1812"!

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The Heloderma Horridum.

Soon after publishing an illustration of the lizard which crawls about under the weight of the above frightful name, in our issue of October 7, 1882, we had inquiries from various sources for further information relative to the *Heloderma horridum* and its habits. In the paper referred to, page 231, vol. xlvii., and in previous issues considerable is said respecting the harmlessness of the creature on the one hand, and its venomous qualities on the other. It seems the subject relating to the above species of lizard came up for discussion at a recent meeting of the College of Physicians, in Philadelphia. Drs. Mitchell and Reichert exhibited a living specimen of this lizard, and the former read a paper on the nature of the poison, in which he arrives at the following conclusions: The *Heloderma horrida*, which is found in Arizona, is the only one of the lizard family that is poisonous. It is usually sluggish in its habits, and will not bite unless provoked; but when the full sized lizard (it grows to a length of three feet) does bite, it produces a poisonous wound, which may prove fatal. For the purpose of experiment, Dr. M. caused the lizard to bite on the edge of a saucer, and when saliva commenced to flow it was caught on a watch glass. Differing from the saliva of venomous reptiles, which is always acid, the saliva of the *Heloderma* is alkaline. A very small quantity injected into a pigeon produced its effect in a tottering gait in less than three minutes, and caused death in less than nine minutes. The specimen presented was fourteen inches long, fat and plump, and presented somewhat the coloring of a rattlesnake.

Why Aniline Black turns Green.

According to C. Koechlin in the *Farberei-Muster Zeitung*, the low temperature at which they are formed is the cause why some aniline blacks turn green. Black prepared at temperatures above 70° C. (158° Fah.) will never turn green, no matter what metallic salt was employed in its preparation, provided there was enough of it, and that the action lasted long enough.

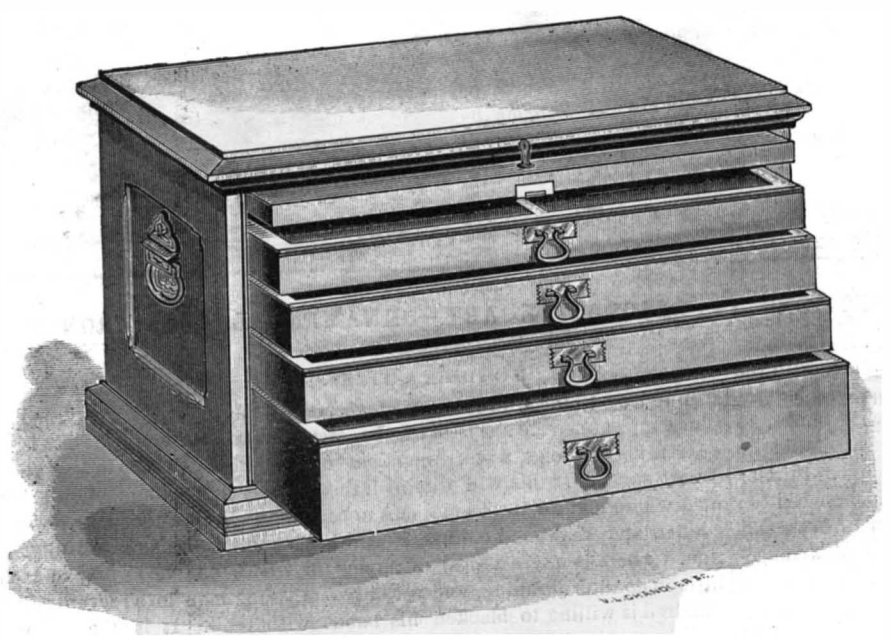
The effect of heat is best seen in Lauth's process of dyeing with oxide of manganese in aniline solution. If worked cold it produces a black that turns green, and so it does if the temperature is not over 50° C. (122° Fah.). Between 50° and 60° C. the black still shows some change, while in that formed between 75° and 100° C. (167° to 212° Fah.) no change at all can be noticed. In dyeing by Lauth's system the aniline solutions blacken rapidly and the colors smut off, which may be due to the formation of manganese brown. This evil can be removed by adding to the aniline one-twentieth of its weight of naphthylamine, and working with very dilute solutions, for example, 2 or 4 grammes of the sulphate of the alkaloid and 20 grammes of "*Leiocome*" or roasted starch to the liter (0·2 or 0·4 per cent). This process is the quickest and cheapest, and has least effect on vegetable fibers. When chromate of potash is used the cloth is first saturated with aniline, then put through a boiling bath saturated with the chromate (40 per cent).

A NEW TOOL CABINET.

The accompanying engraving illustrates a very ornamental and convenient chest of drawers of varying depths, for holding different sized small tools, such as are used by watchmakers, jewelry repairers, dentists, and others using delicate instruments.

Under the top of the cabinet directly above the drawers, a panel is slid quite out of the way. After using the contents of the cabinet for the day, the instruments are placed in their respective places in the drawers, when the latter are closed and the panel is brought down over the front and locked, fastening all the drawers, and at the same time producing a harmonious and ornamental appearance to the cabinet on all sides. The cabinet is made preferably of black walnut, and is handsomely mounted with bronze and nickel plate trimmings. But they may be manufactured of other woods, and the drawers changed in height or divided differently from the one we are describing, to hold mineral specimens, coins, or other curiosities.

These cabinets are made and sold by Messrs. Goodnow & Wightman, 176 Washington Street, Boston, Mass.



NEW TOOL CABINET.

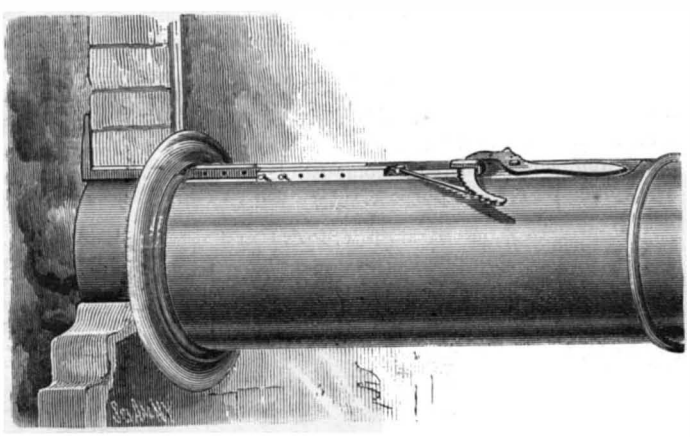
Ants that Eat Roses.

Recently, while looking over some standard roses that are being forced in a peach house, I noticed some of the flower buds covered with ants, and thinking they were after aphis or some other insects, I examined the buds more closely, and, to my surprise, found that they were greedily eating away at the buds, and had already spoilt several of them by eating right into the buds, where, on examination under my pocket lens, some were busy eating, while others seemed to be sucking the juice out of the embryo petals. I immediately had pieces of old sponges soaked in paraffin and tied round the stems, which soon put a stop to their rosebud feast, and necessitated their setting off in search of fresh pastures. It is pretty well known that they eat the pistils out of peach flowers, but I was not aware till recently that the ant was an enemy to the rose also.—*H. Henderson, in Gardners' Chronicle.*

HUTTINGER'S STOVEPIPE FASTENER.

The annexed engraving represents an improved fastening for stovepipes, recently patented by Mr. A. Huttinger, of Liverpool, O. The device consists of a hook lever pivoted on the side of the pipe to be fastened, near the end which enters the chimney or flue. A rod extends from the hook of the lever along a groove in the side of the pipe and through the pipe hole, and has an elbow or hook to engage with the chimney wall or other place with which the pipe is to connect.

The pipe is drawn up tightly by turning the hook lever,



HUTTINGER'S STOVEPIPE FASTENER.

and is retained by a pawl which engages notches in the back of the hook. It may also be retained by pins passing through holes in the rod, and in its guides. The hook of the lever acts as a cam by engaging the end of the rod.

This device is inexpensive, easily applied, and insures the firm support of the pipe.

Grindstones.

Grindstones are made from the more compact sandstones, varying in texture and compactness according to the work required. Those of England are highly esteemed. Different localities of that country afford such as are required for almost every purpose. Among these the "Newcastle" stones, from the coal measures of Northumberland and the adjacent counties, have a pre-eminence in England for general purposes; others are employed for grinding, while many varieties are used as plane surfaces for whetstones. Other qualities are used for hones. A German variety is famous for this purpose. The very finest qualities, composed of an almost impalpable agglutinated powder, are used as oil stones. Such are the "Water of Ayr" and "Blue" stones, and the "Turkey" oil stone. The old "Royal Exchange" of London was paved with this stone, and when it was burned, about 1834, the pavement yielded a handsome amount toward the re-erection.

The Nova Scotia and Berea, Ohio, grindstones are largely employed in this country; these may be obtained of very large size and uniform quality. The Washita, Arkansas, stone is of the very finest quality, being sharp and clean, and is made into a great variety of forms: grindstones, whetstones, hones, and slips of various sizes and forms.

In dressing rough grindstones the process of hacking is employed. Hacking consists in notching the projecting parts with a short handled hammer resembling an adz. Laps used in polishing stones, etc., are jarred by holding an old knife against their edges, so as to vibrate or chatter, making a slight indentation at each jump; these serve to retain the finely powdered emery or rottenstone mixed with adhesive material, with which the lap is covered.

For clearing the surfaces of stones, in which particles of iron or steel have become embedded, a square bar of one-half to one-quarter inch iron is held and wabbled against the edge while in motion. This is called straggling or ragging.

Turning or roving is effected by reversing the motion of the stone and holding a hooked flat tool against its edge, which is afterward further smoothed by the roving plate.

The series of operations in making grindstones is about as follows:

The layer or ledge of rock being uncovered, channels are cut at each end of the slab to be removed, and then a row of holes is drilled on the line where the fracture is to be made. Steel wedges are driven into these holes, driving them consecutively a little at a time, keeping all on a strain, until the mass cleaves from the ledge forming a large parallelopiped. This block is similarly divided into squares, and these, if too thick, are split or cleft in the plane of the stratum to the thickness required. The square stone is now chipped into an octagonal shape, when it is ready to have the eye made. This is done by the pick hammer. It is then mounted on a mandrel driven at the rate of 125 revolutions a minute. The turning tools are five feet long, one and a half inches wide, and five-eighths of an inch thick, tapered to a point by the blacksmith, and afterward hammered to a hooked point by the workmen, who turn from one hundred to two hundred a day, according to size. An exhaust fan withdraws the stone dust, and a conductor leads it to the outside of the building. The stones are placed in a row, an iron rod and wooden axis through them, a wooden head at each end being jammed against the stone by nuts. Slats nailed to the wooden heads and hoops over the slats complete the package. The works at Berea, Ohio, are the largest in the United States.

The large grindstones employed in grinding gun barrels are eight feet in diameter, and are used until they are reduced to a diameter of about two feet, when they are rejected. They are placed in a case with holes for the introduction of the barrel, which is temporarily slipped upon a rod, a crank at one end of the latter enabling the barrel to be turned while the stone is rapidly revolved. The case keeps the water from splashing upon the workmen, and may afford some protection against pieces when the stone bursts, as it sometimes will, owing to the rapid rate at which it is driven. The danger of fracture cannot be entirely obviated, but may be much lessened by clamping the stone on its axis by disks instead of wedges inserted between the sides of the eye and the square arbor on which it is suspended. It would seem possible to avoid the eye altogether, and depend upon check pieces with studs or projections which penetrate into depressions in the sides of the stone. The stones are so heavy that their fracture when in rapid motion is apt to do great damage to life, limb, and property. Artificial stones are largely employed, especially in dry grinding and polishing.

The corundum stone used by the Hindoos and Chinese is composed of corundum powdered, 2 parts; lac resin, 1 part. The two are intimately mixed in an earthen vessel, kneaded, flattened, shaped, and polished. A hole for the axis is made by a heated copper rod. The grain is more or less fine according to the grade of the powdered corundum. The whole is mounted horizontally, and revolved by a bow in the right hand of the workman, while the left applies the work to the stone. The following recipe may also be employed: Sand of the required fineness, 3 or 4 parts; shellac, 1 part; melted, incorporated, and moulded under pressure.

Ransome's artificial stone, sand agglomerated by silicate of lime, has been used for grindstones with excellent effect.

In a test trial between Ransome's (English) artificial grindstones and some Newcastle grit, to ascertain which had the greatest abrasive effect, it was found that the Ransome stone ground away a quarter of an ounce from a steel bar three-quarter inch diameter in sixteen minutes, while a Newcastle stone (natural grit) driven at twenty per cent greater speed required eleven hours to effect the same work.

Stones for grinding cutlery vary in diameter from 4 inches to 2 feet. The faces of some, as of those for grinding razors, are convex. Those for dry grinding, an operation very detrimental to health, have a flue above, through which the small particles of stone and metal are driven by an air blast. The angles formed by the faces of the cutting tools increase in proportion to the hardness of the material to be operated upon. Thus, the razor has an angle of from 17° to 20°, wood cutting tools 25° to 45°, tools for iron and steel 60° to 70°. For reaming tools the angles are greater; for the hexagonal broach, 120°; octagonal, 135°.

Great care should be taken, where tools requiring an accurate edge are to be ground, to keep the face of the stone true. This may be effected by hanging a pair of grindstones so that their faces shall touch. Their rotation thus causes each to wear away the inequalities of the other.

The teeth of circular saws may be sharpened by a small grindstone having on the edge a ridge suited to the form of the teeth, and a slide fitted with an adjustable stop to regulate the abrasion.—*American Glassware Reporter.*

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Correspondence.

The Obelisk in Central Park.

To the Editor of the Scientific American:

I see in your issue of last week a communication in which it is asserted that the "Obelisk" in Central Park is a concrete structure and can be easily reproduced in native materials.

I hand you, inclosed, a piece of its companion, the obelisk which now stands on the Thames Embankment, London. Please examine it, and judge for yourself and your readers whether it is a natural or an artificial stone.

I call it a fine specimen of granite, and Professor Leeds, who is, I think, an authority in such matters, fully agrees with me. You will find it to consist of silex, mica, and beautiful crystals of orthoclase feldspar.

A large fortune is in store for the man who can make a concrete or beton like this.

R. H. THURSTON.

Stevens Institute of Technology, Department of Engineering, Hoboken, N. J., March 26, 1883.

[The specimen sent by Professor Thurston is native granite of superior quality. Our correspondent who pronounced the Central Park obelisk to be an artificial compound is evidently mistaken.—ED.]

The Australian Rabbit Plague.

To the Editor of the Scientific American:

In notice in the SCIENTIFIC AMERICAN of the 25th of November, 1882, an article regarding the rabbit plague in Australia. My brother-in-law, who is a large grower of pine trees in Germany, was formerly greatly bothered by the same pestilence, and conceived the idea of having the rabbits exterminated by their natural enemy, the fox. Now I should think this could also be effectually done in Australia. Let the government introduce a large number of foxes, and prohibit their killing; in a short time the effect would be evident.

L. D.

Rotterdam, March 10, 1883.

Animals as Doctors.

M. G. Delaunay, in a recent communication to the Biological Society, observed that medicine, as practiced by animals, is thoroughly empirical, but that the same may be said of that practiced by inferior human races, or in other words, by the majority of the human species. Animals instinctively choose such food as is best suited to them. M. Delaunay maintains that the human race also shows this instinct, and blames medical men for not paying sufficient respect to the likes and dislikes of the patients, which he believes to be a guide that may be depended on. Women are more often hungry than men, and they do not like the same kinds of food; nevertheless, in asylums for aged poor, men and women are put on precisely the same regimen. Infants scarcely weaned are given a diet suitable to adults—meat and wine, which they dislike, and which disagree with them. M. Delaunay investigated this question in the different asylums of Paris, and ascertained that children do not like meat before they are about five years of age. People who like salt, vinegar, etc., ought to be allowed to satisfy their tastes. Lorain always taught that with regard to food people's likings are the best guide. A large number of animals wash themselves and bathe, as elephants, stags, birds, and ants. M. Delaunay lays down as a general rule that there is not any species of animal which voluntarily runs the risk of inhaling emanations arising from their own excrement. If we turn our attention to the question of reproduction, we shall see that all mammals suckle their young, keep them clean, wean them at the proper time, and educate them; but these maternal instincts are frequently rudimentary in women of civilized nations. In fact, man may take a lesson in hygiene from the lower animals. Animals get rid of their parasites by using dust, mud, clay, etc. Those suffering from fever restrict their diet, keep quiet, seek darkness and airy places, drink water and sometimes even plunge into it. When a dog has lost its appetite. it eats that species of grass known as dog's grass (*chiendent*), which acts as an emetic and purgative. Cats also eat grass. Sheep and cows, when ill, seek out certain herbs. When dogs are constipated they eat fatty substances, such as oil and butter, with avidity, until they are purged. The same thing is observed in horses. An animal suffering from chronic rheumatism always keeps, as far as possible, in the sun. The warrior ants have regularly organized ambulances. Latreille cut the antennæ of an ant, and other ants came and covered the wounded part with a transparent fluid secreted from their mouths. If a chimpanzee be wounded, it stops the bleeding by placing its hand on the wound or dressing it with leaves and grass. When an animal has a wounded leg or arm hanging on, it completes the amputation by means of its teeth. A dog on being stung in the muzzle by a viper was observed to plunge its head repeatedly for several days into running water. This animal eventually recovered. A sporting dog was run over by a carriage. During three weeks in winter it remained lying in a brook, where its food was taken to it; the animal recovered. A terrier dog hurt its right eye; it remained lying under a counter, avoiding light and heat, although habitually it kept close to the fire. It adopted a general treatment, rest and abstinence from food. The local treatment consisted in licking the upper surface of the paw, which it applied to the wounded eye, again licking the paw when it became dry. Cats also, when hurt, treat themselves by this simple method of continuous irrigation. M. Delaunay cites the case of a cat which remained for some time lying on the bank of a river; also that of another cat which had the singular fortitude to remain for forty-eight hours under a jet of cold water. Animals suffering from traumatic fever treat themselves by the continued application of cold water, which M. Delaunay considers to be more certain than any of the other methods. In view of these interesting facts, we are, he thinks, forced to admit that hygiene and therapeutics, as practiced by animals, may, in the interests of psychology, be studied with advantage. He could go even further and say that veterinary medicine, and, perhaps, human medicine, could gather from them some useful indications, precisely because they are prompted by instincts which are efficacious in the preservation or the restoration of health.—*British Medical Journal.*

Early Potatoes.

A correspondent of the *Country Gentleman* says: The earliest potato, as far as my experience goes, is the Early Electric. Last season, in order to test the comparative earliness and yield of the new varieties alongside of the well known kinds, I planted at measured distances a definite number of hills of each of the kinds given in the following table. They were all planted in the midst of a field of potatoes, and given the same cultivation as the whole field. Single eyes were planted, one in a hill, on the 15th day of May.

Name.	*Time of ripening.*	*Product per acre.*
Early Electric	Aug. 7	93⅓
Early Ohio	Aug. 15	116⅔
Early Mayflower	Aug. 15	177½
Brownell's Best	Sept. 7	237½
Clark's No. 1	Sept. 1	162⅔
Early Telephone	Aug. 15	175
Beauty of Hebron	Sept. 1	179½
Early Rose	Sept. 1	159
Magnum Bonum	Sept. 10	157¼
Late Rose	Sept. 15	194
Snowflake	Sept. 7	189
White Star	Sept. 25	206
White Elephant	Sept. 25	232
Burbank	Sept. 25	220
Matchless	Sept. 15	135
Pride of America	Sept. 25	191½
Late Snowflake	Sept. 25	226½
Belle	Sept. 15	225
Defiance	Oct. 1	382⅔
St. Patrick	Oct. 1	250
Rose's Seedling	Oct. 1	228
Roger's No. 4.	Oct. 1	299½
Watt's Orange	Oct. 1	237½
Queen of the Valley	Oct. 1	199
Champion of America	Sept 25	258
Roger's No. 7	Sept. 25	258
Cook's Superb	Sept. 25	254½
Silverskin	Sept. 25	234
Mammoth Pearl	Sept. 25	257

The dying of the tops was taken as the period of ripening. It will be seen that the Early Electric is three weeks earlier than Early Rose. Had it been planted very early, I presume the yield would have been satisfactory. The Defiance was by far the best producer; quality good. The handsomest potato was Rose's Seedling; all large. Great care was necessary in making the experiment, which those who grow potatoes expressly for seed will appreciate.

A New Use for Gas Mains.

From time to time notices have appeared in these columns of the pneumatic clock system introduced by MM. Popp and Resch. In this system a great number of subscribers' dials are regulated by pneumatic impulse traversing a service of air tubes actuated from a central station. The success of this scheme has inspired an American company with the idea of doing the same work without undertaking the trouble and expense of a distributing service of air tubes by the simple expedient of utilizing the existing gas pipes. This enterprising body of speculators have secured a patent for their system, which is thus described: "A special gas holder for holding gas under a pressure greater than the normal pressure in the mains, is so arranged in connection with the gas holder and mains of a common gas lighting system that at certain times it is opened to the mains, and thus imparts an impulse to the gas therein contained. One leg of a U-tube, partly filled with mercury, is placed in connection with the mains, and receives the impulse of pressure already mentioned, which causes the mercury to rise in the other leg, and thereby completes an electrical circuit, and gives a signal which can be used for regulating clocks or any similar purpose." Thus it will be seen that the invention, like all other great ideas, is as simple as it is grand. Only one thing is needed to make the proposal practical—the consent of the gas companies; but of this nothing is said.—*Journal of Gas Lighting.*

New Invisible Ink.

C. Widemann communicates a new method of making an invisible ink to *Die Natur*. To make the writing or the drawing appear which has been made upon paper with the ink, it is sufficient to dip it into water. On drying, the traces disappear again, and reappear by each succeeding immersion. The ink is made by intimately mixing linseed oil, 1 part; water of ammonia, 20 parts; water, 100 parts. The mixture must be agitated each time before the pen is dipped into it, as a little of the oil may separate and float on top, which would, of course, leave an oily stain upon the paper.

The Great Red Spot on Jupiter.

BY G. D. HISCOX.

The phenomenon of the now famous red spot upon the surface of the planet Jupiter has drawn the attention of observers to an apparent condition of internal planetary activity not heretofore observed, or only beginning to be seen through the means of the great advance in telescopic power and definition lately acquired.

The intensity of this spot seems to be now vanishing after a duration of about three and a half years, during which time observations have been made of its physical appearance and for the purpose of detecting any local or relative change of position. Also for the purpose of ascertaining the period of rotation of the planet, as compared with the period heretofore assigned from observations of its cloud spots.

The two periods of rotation are observed to vary about 5½ minutes; giving the rotation by the cloud spots as 9 h. 50 m. to 9 h. 50 m. 9 s., while the rotation by the great red spot was found to be 9 h. 55 m. 34 s.

The times given for rotation by observations upon different cloud spots also vary enough to give us, together with the varying contour of the cloud belts, strong evidence that what we see of the planet Jupiter is not the body of the planet itself, but rather a vast sea of *cloud*, possibly thousands of miles in depth, kept afloat by the intense heat of the body of the planet.

From the well known laws of circulation of gases, vapors, and cloud masses, as illustrated by the circulation of the atmosphere, together with the progress and direction of the great storms, cyclones, and tornadoes upon the earth, and as are beginning to be elucidated in the cyclonic action of the sun spots, according to Faye's theory, which best meets the conditions deduced from spectroscopic observations; we cannot do otherwise than come to the conclusion that the solid body of Jupiter has never been seen—that our observations are only of the surface of vast envelope of cloud, that by its rapid rotation is constantly creating and keeping up an intercirculation, such as our trade winds and equatorial doldrums, upon a vast scale.

In this connection we have only to carry our minds back to the beginning of the Azoic age of our world, and to imagine the surface just crusting over and still red hot in zones, with our entire oceans hanging as a vast cloud above, and precipitating its dense vapors as rain upon the hot and hissing surface. It was then that the activity of natural forces were at their height. It was then that the upheaval of the intensely heated masses from below met the cloud bursts from above, and produced the same class of phenomena that has lately been observed, upon a vastly larger scale, upon the planet Jupiter.

If, in view of the low density which has heretofore been given for Jupiter, we can reasonably accept an atmospheric or cloud depth of eight or ten thousand miles, the apparent great diameter of the red spot may be assumed as only the irradiation to, and illumination of the deep cloud stratum by an igneous mass, much smaller than the apparent size of the red spot, as we see it from the earth.

The size of the great spot, 26,000 by 8,000 miles, may be, for a planet 88,000 miles in diameter, only the illumination of a reasonable upheaval of the highly heated mass of the interior corresponding with the remains of such masses upon our earth.

The apparent retrograde motion I think is illusory, for I see no tenable reasoning to sustain the theory that has been advanced that it is a floating island, or crust floating upon a liquid surface. Nor does there appear any good reason for regarding it as of a periodical character, or bearing any relation to other periodical physical phenomena, as suggested by the Dearborn observer. But on the other hand, an assertion in the report of the Dearborn observations, "that the apparent center of the red spot does not coincide with the true center, except when on the central meridian," goes far to explain the theory that the red spot, as seen by the telescope, is an area of the outer cloud stratum illuminated by an igneous mass upon the body of the planet. And also that its diurnal rotation should be fixed by the observed rotation of the red spot, instead of as heretofore by the rotation of the cloud spots.

American Pork in Europe.

At the last meeting of the French Academy of Sciences, M. Bouley, in presenting a work by M. Joannes Chatin on trichinosis, stated that the work had converted him to the opinion that France ought to devote her energies to the production of pork sufficient for the home demand, and absolutely prohibit importations of American pork, which, he said, almost invariably contains trichinæ, and is nourished on "unnamable *débris*."

The new German law prohibiting the introduction of American pork has quite recently gone into operation. But it is said that our pork exporters rely upon the continuance of the trade by diversion through England, France, and other countries. They assume that the Germans must and will have American pork, law or no law, worms or no worms.

WE had thought that paper had been put to the utmost uses some time ago, when machinery belting, car wheels, etc., had been made of it; but now we learn that in Breslau, Germany, a chimney fifty feet high has been erected of paper pulp, chemically prepared to resist combustion. What will paper be used for next?

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APPARATUS FOR TESTING BREADSTUFFS.

In the accompanying plate, reproduced from the industrial publication, *Machines, Outils et Appareils*, are represented the various apparatus used in France for ascertaining the composition and quality of breadstuffs, such as their density, their hydration, their proportion of gluten, their degree of expansibility, etc.

DENSIMETER (Figs. 1 and 2).

Fig. 1 represents, in vertical section, the little instrument called a *densimeter*, by means of which it is easy to measure density with great accuracy. It is nothing else than a glass flask, A, closed by a hollow stopper, B, which is surmounted by an elongated tube terminating in a small funnel. Toward the center of this tube there is engraved a horizontal mark, *a*, which indicates what shall be the level of the distilled water with which the flask is filled. After the flask has been filled with water it is accurately weighed, and, as this weight will always be the same, it may then be marked on the bottom of the vessel. Thus the weight of the densimeter figured is 85·25 grammes when it is full up to the mark *a*. To use it we begin by weighing exactly 10 grammes of the grain to be tested, and which we then put into the flask, taking care afterward to shake the latter so as to free it from air bubbles, and then to close it. If the level does not reach the mark, *a*, a small quantity of water must be added; but if, on the contrary, it exceeds it, the excess must be removed by absorbing it with a piece of twisted bibulous paper introduced through the funnel.

When no densimeter like the one described is at hand, the real volume and specific weight of the grain may be estimated quite approximately by means of a tube graduated into cubic centimeters and fractions, as shown in Fig. 2.

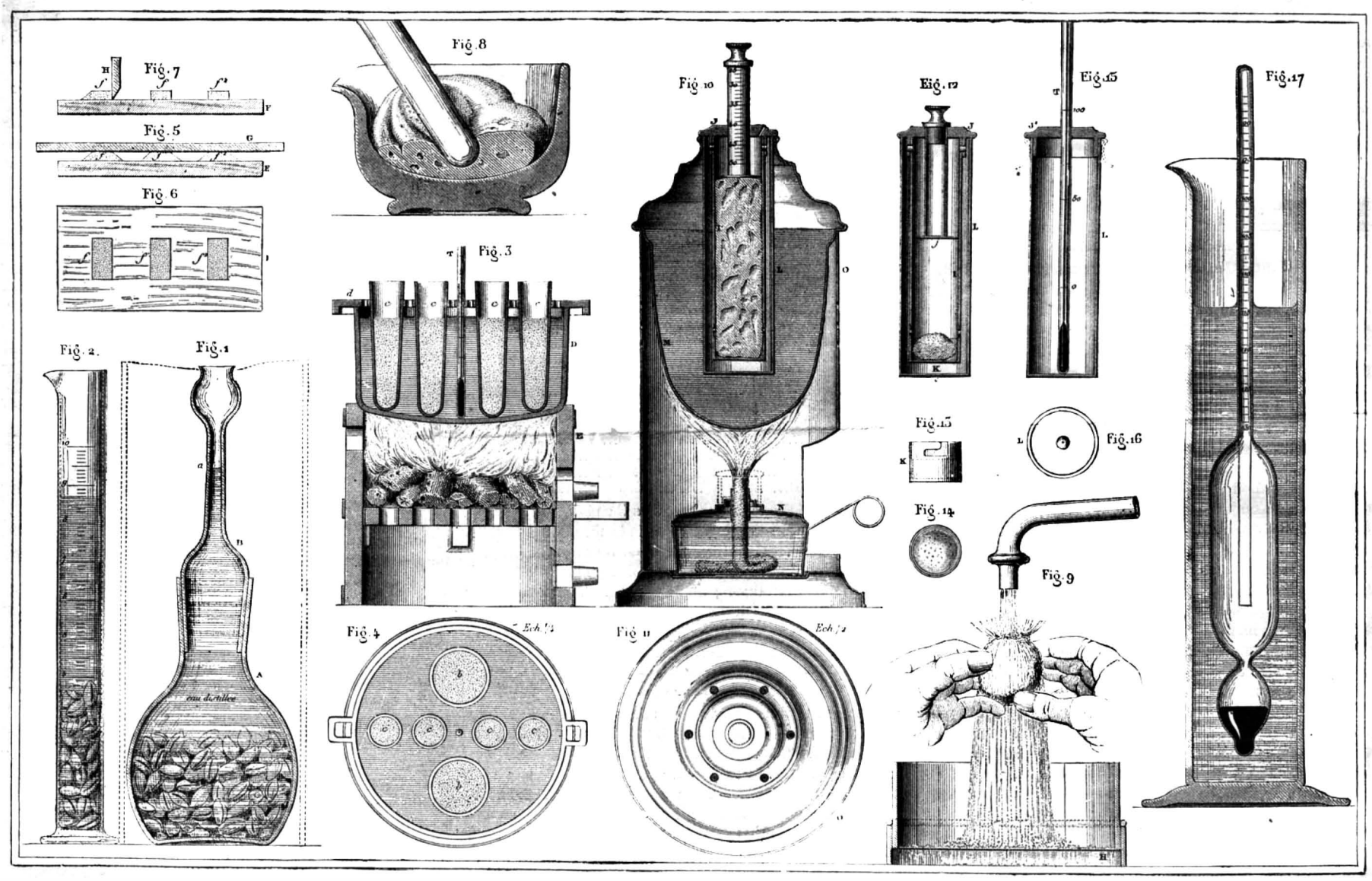
Let us suppose, for example, that this tube is filled with distilled water up to the eighth division, which represents 80 millimeters. If, after weighing a gramme of grains, these be thrown successively into the tube (care being taken to disengage the air bubbles), we shall naturally see the level of the water rise. Now if, after the last grain, such level marks 88 millimeters, we may evidently draw the deduction therefrom that all the grains have displaced but 0·8 of a cubic centimeter of water, and that consequently its density is—

$$10 \div 8 = 1{\cdot}25.$$

DESICCATING APPARATUS (Figs. 3 and 4).

In order to know the proportion of water contained in the grain it is not necessary, when operating upon small quantities, to have a special stove for drying it; but a small apparatus will answer, like that shown in vertical section in Fig. 3, and in plan in Fig. 4. This consists of a pot, D, filled with linseed or neatsfoot oil, and placed over a small laboratory furnace, E, situated under a kitchen chimney funnel. The fuel used may be charcoal or live embers. If gas be at one's disposal, it would be preferable to place the pot on a small portable gas stove.

The samples of grain, having been first crushed in a small marble mortar, are each weighed with care and placed in



IMPROVED APPARATUS FOR TESTING BREADSTUFFS.

When the level is exact, we weigh the whole upon the pan of an accurate pair of scales. We find, for example, that the weight is 87·45 grammes. Now, as the filled flask weighed 85·25 grammes, if we add to these figures the 10 grammes of grain, the total weight will be 95·25 grammes. The difference between these two quantities marks in cubic centimeters the volume of water displaced, say—

$$95{\cdot}25 - 87{\cdot}45 = 7{\cdot}8 \text{ cubic centimeters.}$$

This, then, is the real volume of the grain in cubic centimeters. Consequently, the density is equal to—

$$\frac{10}{7{\cdot}8} = 1{\cdot}282.$$

In general, if we represent by p the weight of the flask and its stopper; P, that of the water it contains; Q, the weight of the grain in open air; x, that of the water that it displaces in the vessel; Q′ being the weight of the flask filled with water and grain; we have—

$$x = Q + (P + p) - Q'.$$

If, in performing the experiment, care be taken to count the number of grains making up the 10 grammes, the mean volume of each grain may be had in cubic millimeters, as well as the number of grains included in a kilogramme. Thus in the example given the 10 grammes contained 195 grains, so the mean volume of each grain was—

7,800 cubic millimeters ÷ 195 = 40 cubic millimeters,

and the number of grains per kilogramme

$$= 195 \times 100 = 19{,}500.$$

capsules of baked clay, *b* (Fig. 4), or in a sort of conical glass test tubes, *c*, all of them supported by a cover, *d*, containing apertures. The oil bath should be heated to a temperature of a little over 100°, which may be ascertained by means of a mercurial thermometer, T, graduated up to 160° to 180°.

After from three-quarters of an hour to an hour the desiccation may be regarded as complete. If, however, on removing the samples and weighing them there is some doubt that they are not entirely dry, they should be put back into the capsules and submitted to a temperature of 120°.

PEKAR PROCESS FOR TESTING FLOUR (Figs. 5, 6, and 7).

Upon a small wooden board, F, covered with a coating of shellac, is placed a small heap of flour, *f*, which is pressed down by means of a piece of plate-glass, G, and then, by means of the cutting edge of a glass tool, H, is given the form of a rectangle. In the same way are arranged other heaps, f^1, f^2, etc., which are placed as near to the first as possible, care being taken to have them of the same thickness. The board thus filled with heaps of flour is immersed in water until the flour is completely wet. When it is taken out, the differences in coloration may be much better distinguished. These differences are rendered still more striking by the addition of 5 per cent of sulphuric acid to the water.

THE OSER PROCESS.

Mr. J. Oser, of Krems, has proposed the following process of testing wheat flour: Sixteen grammes of each flour to be compared are taken and formed into a paste with 8 grammes of water. The stiffest paste indicates that the flour that composes it is the best, and the softest paste, on the contrary, proceeds from the poorest flour.

PROPORTION OF GLUTEN.

Beccari appears to be the first who succeeded practically in isolating the gluten from the other elements of the grain. The best method of doing this with accuracy consists in mixing the flour with half its weight of water in a crystal mortar (Fig. 8) with a glass rod, in order to form a homogeneous paste, which is afterward formed into a ball with the hands and held under a stream of water, as shown in Fig. 9. This water detaches the starch and carries it along with it through a very fine silk sieve, H, which is placed beneath so as to catch all the small particles that have not been sufficiently wet, and that are afterward added to the ball. This latter is compressed, while turning it continuously between the fingers under the stream of water from one-half to three-quarters of an hour, until it contains nothing but gluten. This state of its composition may be known from the appearance of the water, which, when it flows through the sieve clear and limpid, gives evidence that it contains no longer any starchy material. Not only is the gluten then freed from the starch that it contained in its tissues, but also from all other soluble bodies that accompanied it. In this state it is strongly compressed in the hand to express a part of the water that it stills holds mechanically, and then weighed.

When the operation is performed carefully, absolutely not a particle of the gluten is lost, and consequently the method may be regarded as sufficiently exact in practice.

BOLAND'S ALEUROMETER (Figs. 10 to 16).

We owe to Mr. A. Boland the remarkable instrument called an *aleurometer*, and which is designed to measure the degree of expansibility of gluten.

The apparatus consists of a small copper cylinder, I (Figs. 10 and 12), 0·105 of a meter in length and 26 millimeters in diameter. This is surmounted with a screw plug, J, which closes it above, and which serves at the same time as a guide for the hollow rod, *j*. This latter terminates at the base in a flat disk, *j′*, that performs the role of piston, and that enters the cylinder freely so as to occasion no friction when it is raised by the elastic force of the heated gluten, and so as to permit the steam to escape above. The rod is graduated into 25 equal parts. The first division, corresponding to the point 25, is immediately under the button that rests on the cover, J, and the last is 50 millimeters lower down; consequently each degree corresponds to a separation of 2 millimeters, and this same point, 50, is 11 millimeters above the disk—a distance equal to the thickness of the cover. Finally, to the lower part of the cylinder is affixed, by a bayonet catch, a small receptacle, K (Figs. 13 and 14), 13 millimeters in height, the upper edge of which is also 50 millimeters beneath the diaphragm, *j′*. It is into this receptacle that is placed the ball of gluten whose elasticity is to be tested. The

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cylinder, I, forming the aleurometer properly so called, is placed, when operating, in a copper sheath, L (Fig. 15), which is placed in an ellipsoidal vessel, M (Figs. 10 and 11), that performs the role of a stove, and that is filled to a certain height with neatsfoot oil heated by a spirit lamp, N, placed underneath. The sheath, L, which is wholly immersed in the oil, has a flat bottom, and is closed above with a cover, J' (Fig. 15), which may be taken off and put on at will to permit of the introduction and removal of the aleurometer, as seen in Fig. 10, or of the introduction of a thermometer, T (Fig. 15), that marks from 50° to 200° C.

The entire apparatus is inclosed in a thin copper jacket, O, containing apertures in the upper part of its circumference, and united with a circular copper base that carries a spirit lamp, N.

While the paste is being prepared as described above, the oil bath is heated up to 150°. Then the gluten is inserted in the receptacle, K, and the aleurometer is placed in the vessel, M. As the capacity of the cylinder, I, and of its receptacle, K, is limited to the dimensions indicated, only 7 grammes of the gluten are taken, and with this a small ball is formed which is rolled in dry powdered starch to prevent it from sticking to the sides of the instrument, which itself has been slightly oiled. After the introduction of the cylinder containing the gluten into the oil the temperature of the latter is kept up for ten minutes, and then the lamp is extinguished. The apparatus is then left to itself for ten minutes longer, and after the height to which the diaphragm has risen has been ascertained, the diluted gluten is taken from the aleurometer.

Mr. Boland explains that the gluten, under the influence of the water that it contains, and which is disengaged in the form of steam through the orifice, *o*, dilates and rises and solidifies, moulding itself as it does so against the inside of the cylinder. In its expansion it traverses, first, the empty space of 25 degrees that separates it from the diaphragm, *j'*, and acquires enough force to raise the latter several times its maximum of dilatation, expressed by the 50 degrees brought to light above the cover or screw cap, J.

It may happen that the gluten does not reach the rod—that is to say, that it does not possess 25 degrees of dilatation. This would indicate that the flour whence it was derived was unfit for making bread.

ROBIN'S APPRECIATOR (Fig. 17).

In his treatise on baking, Mr. Boland says: "One of the most intelligent bakers of Paris . . . has found that gluten acquires solidity in cold water, softens in hot water, and loses its consistency in water about to boil; that mineral acids convert it into a material that he compares with bitumen; that vegetable acids dissolve it more or less; and, finally, that it may be totally dissolved by leaven when the latter has passed the limit of alcoholic fermentation and a formation of acetic acid has occurred. The apparatus devised by him (Fig. 17) to determine the quantity of gluten contained in flour is based upon the solubility of this substance, and of the albuminous matter in diluted acetic acid without touching the amylaceous matter. It is nothing else than a very sensitive areometer, whose divisions make known at first glance the number of 2-kilogramme loaves that a 157-kilogramme bag of flour will furnish, provided, always, that the gluten is of good quality."

Mullein as a Remedy for Coughs.

Dr. Quinlan, of Dublin, who last year read a paper at the British Pharmaceutical Conference on the hemostatic properties of the *Plantago lanceolata*, has recently investigated the properties of the common mullein, *Verbascum thapsus* (*British Medical Journal*, January 27, p. 149). This plant has long been used in Ireland as a domestic remedy for consumptive cough, and Dr. Quinlan has made a series of experiments with a view to determine if it really possesses the valuable properties attributed to it. He finds that when boiled in milk the patient takes the decoction readily, and experiences a physiological want when it is omitted. Its power of checking phthisical looseness of the bowels and the relief afforded to coughing were very marked, so that the patients took hardly any other cough mixture. In early stages it appears to have a distinct power of increasing weight, but in advanced cases Dr. Quinlan remarks that he is not aware of anything that will do this except koumiss.

Cleaning Watches with Benzine.

A correspondent of the *Watchmaker and Metalworker* tells how he cleans watches with benzine. The method may be useful for other fine work. He says: I immerse the parts in benzine and dry in boxwood sawdust. This gives the gilding a fresh, new look which I have not been able to get by any other process. The movement must be entirely taken down. The dial screws may be screwed down tightly and left, but all parts united with screws must be separated, so that there will be no places where the benzine can remain and not be at once absorbed by the sawdust.

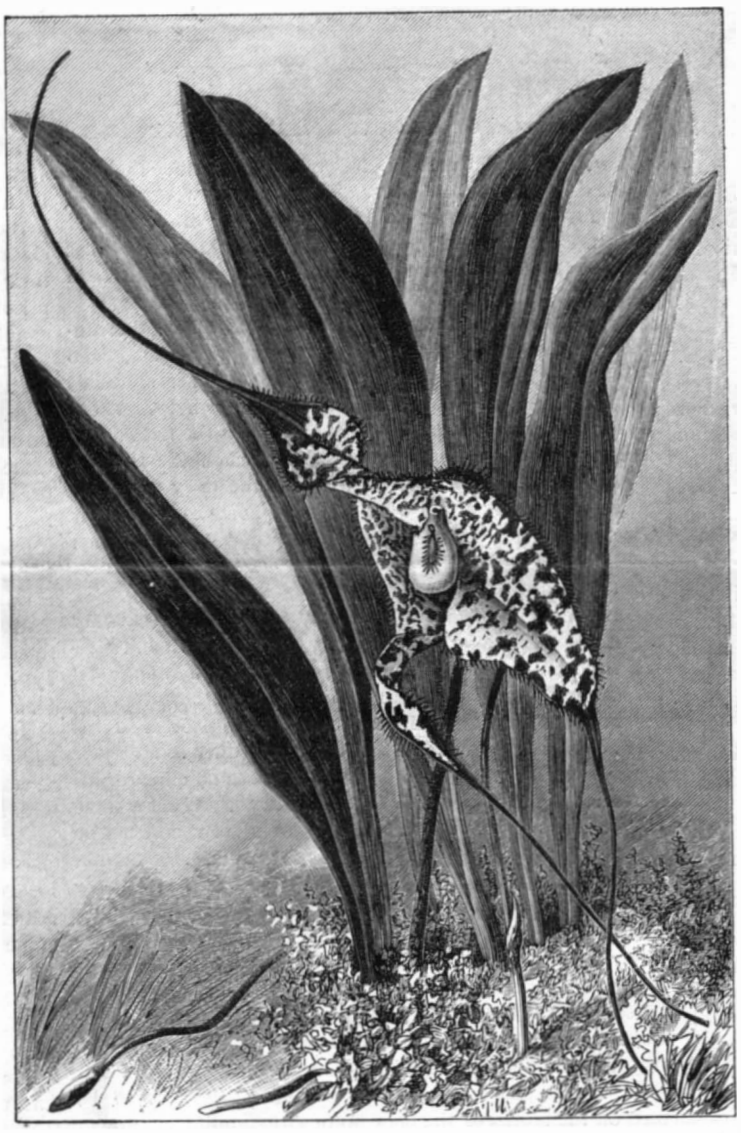
I have a large alcohol cup, which I fill about half full of benzine, taking down my movement and putting the larger pieces in the fluid. The scape wheel, balance, and delicate parts I treat separately, that they may not be injured by contact with the heavier pieces. I then take the pieces one at a time, and tumble them into the sawdust. In a few seconds they will be dry, when I pick them out and lay in a tray, using brass tweezers, which do not scratch. I treat all the parts in this way except the mainspring, when a slight use of the brush and clean chamois will remove all dust. Of course, the holes must be cleaned with a pointed peg; and I wipe out the oil sinks with chamois over the end of a blunt peg, but it is not often necessary to clean the pinions with a peg; they will come out of the sawdust bright and clean.

The mainspring must not be put in benzine unless you want it to break soon after. The fluid seems to remove the fine oily surface which a spring gets after working for a time, and which is very desirable to retain; so I clean my springs by wiping with soft tissue paper. If they are gummy I put on a little fresh oil to soften, and wipe off, being careful not to straighten out the spring.

THE MASDEVALLIA CHIMÆRA.

The *Masdevallia chimæra* is one of the most fantastic productions of the vegetable kingdom. In looking at this strange flower one sees the colors of a nocturnal bird, the form of a large spider in the middle, with two small piercing black eyes.

This flower is a native of the deep, humid valleys of New Granada. B. Roezl discovered it in the valley of Cauca, in 1872, and since that time it has been found successively by



THE MASDEVALLIA CHIMÆRA.

G. Wallis, Klabosch, and other collectors of ornamental plants.

The *Masdevallia chimæra* was described for the first time in 1872 by M. H. G. Reichenbach, but incorrectly. The description has been corrected since, but it is none the less true that the history of the flower is still full of contradictions. The plant which was described in 1873, in the *Illustrated Horticulturist*, under the name of *M. chimæra* was not the one which M. Reichenbach described under this name, but is apparently another species—the *M. nycterina*. The various illustrations of *M. chimæra* which have appeared in some botanies differ considerably from each other in the coloring, and even in the form of the flowers; it appears that this species is really polymorphous. Roezl has even disputed the identity of the plant described by M. Reichenbach with the one discovered by him, to which he persists in attributing much larger dimensions and several particular characteristics. Recently the *Gardeners' Chronicle* published a description of this flower, which is similar to the one described by Roezl.

The *Masdevallia chimæra*, which we illustrate, flowered in the month of November, in the collection of M. F. Massange de Louvrex, Chateau of St. Gilles, Liege. It is very much like the one described and illustrated by M. W. G. Smith in the *Gardeners' Chronicle*, and it presents all the characteristics attributed to this species in the recent description by the learned orchidologist of Hamburg.

The culture of these plants is not difficult, but certain conditions are necessary. The most important is the quality of the water, which must be free from lime, pure, and fresh. The air should also be pure as that of the mountains. The temperature should not be raised either day or night. As to the soil, the less earth there is, the better it will be. Living moss is sufficient, with good drainage of pieces of broken crocks and charcoal; there may be added some fragments of fibrous earth.

The plant is developed in compact bunches of leaves, thick, and of a relative length of 0·20 m.; the flower stems, slender and also lengthened (0·10 m.), creep in the moss, and are terminated by a very large flower (0·20–0·25 m.), which blossoms under the leaves, unless it is supported by a light prop. The flower cup is very open and deeply divided into three diverging lobes, whitish, but abundantly speckled with small, unequal, and irregular spots of dark pink, and all bristling with hairs, scattered but abundant, white or rose colored, according as the surface from which they proceed is one or the other color.

The lobes are directed, one upward, the other two downward. All three form an angle a little twisted, especially the upper one. They are prolonged in a long, smooth horn (0·08–0·10 m.), which is rose colored, straight, or a little curved. The two petals are very small (0·003 m.). The lip formed in the inferior petal of the flower is relatively large (0·014 m.); articulated at the base; of a pale pink; it has two converging crests in the middle part; the border has the form of a marine trumpet, raised at the edge, curved internally, and cut into teeth; the extremity large; the bottom has three projecting crests; column very short, curved, pale yellow; ovarium bent upon the peduncle, thick, soft, and of a brown color.—*La Nature.*

Ball Bats.

Probably the largest manufactory is that of Spalding, at Hastings, Mich., where 100 men are employed. Half a million bats are supposed to be the demand for the present year. The *Northwestern Lumberman* says:

Ash is the staple bat wood. The ash bat is universally preferred and used by professional players, and gives the best satisfaction. In the matter of weight, strength, and durability, bats of that wood seem best adapted to the wants of the batter. A proportion of fancy, and necessarily higher-priced, bats are made of cherry. Including the different woods and various sizes, there are 22 styles of bats made for the trade, ranging in price at retail from 10 cents for a juvenile article up to $1.50 for an æsthetic cherry bat.

The Hastings factory will use in the neighborhood of 350,000 feet of ash, 250,000 feet of basswood, and 50,000 feet of cherry lumber this season, which means about 25,00 gross or 30 car loads of bats, and the demand may be such as to increase the output. Another bat factory at South Bend, Ind., will consume about 125,000 feet of lumber, and one at Grand Rapids, Mich, 75,000 feet more.

The bats made in the East are said to represent about 10 per cent of the total product, and are mainly of a cheap order, many of them being made from pine and oak. Including everything, the estimates made place the amount of lumber consumed in bat making at from 900,000 to 1,000,000 feet. Giving the industry the benefit of the doubt, and figuring the average of two feet to a bat, the figures given at the start are reached—500,000 bats.

The best kind of lumber is required in making good bats, and the stocks of the raw material are kept two years in advance, in order to have them thoroughly dried. Kiln drying is avoided, principally on account of the waste entailed by the method. If made from the kiln dried material, a great many bats would check, and they would have to be thrown out. Hence the precaution is taken of having the lumber in exceptionally good condition as to seasoning and quality before using it in manufacture.

Taking into consideration the prices of the medium and higher grade bats, together with the mere cost of two feet of lumber and the simple work of turning out the bats, it might strike the casual observer that there was considerable money in making bats. Yet, if in the business, a man might find there was less profit than seemed to be the case. The lumber must be good, and must be carried for a considerable time, while it requires good machinery and careful workmanship on as nice a job as turning out a first-class bat.

At the Hastings factory a large number of croquet sets and fishpoles are also turned out, which consume 1,500,000 feet of lumber. Mallets and balls are made of maple, handles of ash, and boxes of basswood. About 1,000,000 feet of maple are used, something over 300,000 feet of basswood, and the remainder is chiefly heart and lance wood for jointed fishrods.

Hay is King.

The statistics of the United States prove that it is among the foremost crops raised in this country, if not the very first. At the present time there are estimated to be, in the United States, 40,000,000 sheep, 40,000,000 cattle, and 20,000,000 horses. In two-thirds of the country these animals require to be fed from three to five months, and they will consume an aggregate of 90,000,000 tons, which, at $5 per ton, represents the enormous sum of $450,000,000. Is not hay, therefore, king?—*Wesley Redhead.*

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DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of New Jersey.

THEBERATH *vs.* THE RUBBER AND CELLULOID HARNESS TRIMMING COMPANY.

Nixon, D. J.:

Letters patent No. 99,032 held invalid.

Letters patent No. 99,032, granted to Theberath, for an improvement in the covering of harness trimmings, held to be invalid for the reason that the invention was in public use more than two years prior to filing the application, that fact appearing from the admissions of the plaintiff upon cross-examination.

Patents for designs have reference to appearance rather than utility. Their object is to encourage the arts of decoration rather than the invention of useful products; but all regulations and provisions that are applicable to the obtaining or protecting of patents for inventions are by section 4,933 made applicable also to design patents.

A design patent may be defeated, therefore, upon proof that articles which revealed to the eye the same design which is the subject of the patent were publicly made and sold for more than two years before the application was filed.

United States Circuit Court.—District of Connecticut.

ANDREWS *et al. vs.* EAMES.

Shipman, J.:

The driven well patent—reissue sustained.

The validity of the reissued patent to Nelson W. Green for driven wells sustained on authority of prior decisions.

The patent is infringed by boring or digging to the sources of the water supply when the soil is rough, or for other reasons it is difficult to drive or press a tube into the soil, provided, before a supply of water is reached, the patented process is thereafter used for the purpose of obtaining an adequate flow of water upon the surface of the ground.

This is a bill in equity to restrain the defendant from the infringement of reissued letters patent to Nelson W. Green, dated May 9, 1871, and commonly known as the "Driven Well Patent." The original patent was issued January 14, 1868. The litigation upon the construction and validity of this patent began in the United States Circuit Court for the Eastern District of New York. Judge Benedict's opinion sustaining the patent (Andrews *vs.* Carman, 13 Blatchf., C. C. R. 307) has been followed by Judge Blatchford (Andrews *vs.* Cross, 8 Fed. Rep. 269) and by the circuit courts in other districts wherever the question has been tried. The decision of Judge Gresham in Hine *vs.* Wahl, also sustaining the patent, has recently been affirmed by an equally divided Supreme Court. In this state of the litigation the construction which was given to the patent by Judges Benedict and Blatchford will be followed without discussion.

The defendant relied upon the invalidity of the reissued patent, its want of novelty, and upon non-infringement.

The first defense presents a question upon which I much desired to read the views of the Supreme Court in Hine *vs.* Wahl, where the question was directly made; but in view of the fact that the court did not declare the reissue invalid, it is not improper to regard the patent as sustained. I may add that my own opinion tends in favor of the validity of the reissue.

Upon the question of novelty the Goode patent and the other printed exhibits have reference to an Artesian well made by boring, and not to a well made by driving, and without removing the earth upward.

The remaining question is that of infringement. The defendant's two wells were made by Frederick B. Platt and Daniel Clark.

The defendant's counsel strenuously urge that these wells were constructed by boring; that the wells were bored until water was struck—that is, until a supply of water was obtained, and that the wells were finished by pressing the pipes more deeply into the source of supply which had been reached when the workmen "struck water." In other words, the defendant seeks to bring the case within the decision of Judge McCrary in Andrews *vs.* Long (12 Fed. Rep. 871). In this case, however, the witnesses, when they used the common expression, "struck water," did not mean that they had reached an adequate source of supply for a well, but that they had reached a place where the presence of water manifested itself, and where by continuous excavation an adequate supply would be attained. The wet sand or wet clay upon the auger showed that water was at hand. The well was then finished and a supply of water was obtained by pressing or driving a tube into the ground, without removing the earth upward, and attaching thereto a pump. When this was done, there was put—

"To practical use the new principle of forcing the water in the water bearing strata of the earth from the earth into a well pit by the use of artificial power applied to create a vacuum in the water bearing strata of the earth, and at the same time in the well pit." (Andrews *vs.* Cross, 8 Fed. Rep. 269.)

A workman in our New England soil would not ordinarily be able to drive or press a tube into the stony or tough crust, which must be penetrated before water bearing strata are reached; but it is no adequate argument against infringement that it is necessary to bore or dig into the rough and hard soil or the mass of tough clay which lies over the sources of water supply, provided, before a supply of water is reached, the patented process is thereafter used for the purpose of obtaining an adequate flow of water upon the surface of the ground.

Let there be the usual decree for an injunction and an accounting.

NEW BOOKS AND PUBLICATIONS.

A HISTORY OF THE PEOPLE OF THE UNITED STATES, FROM THE REVOLUTION TO THE CIVIL WAR. By John Bach McMaster. In five volumes. Vol. I. New York: D. Appleton & Co., No. 1 Bond Street.

The prevailing impression is that all noteworthy facts in our domestic history as a nation have long ago been collected and placed before the public in standard histories, by the ablest writers, and nothing remains to be said that can have any flavor of importance or permanent interest. But this impression, we think, will be speedily removed from the minds of those who study the work above mentioned. Professor McMaster's new volume is full of historical information of the deepest interest; he presents to us a picture of the home life of our fathers, their occupations, amusements, laws, manners, and customs, that will be wholly new to the great majority of readers. Those who have prided themselves on knowing a thing or two about American history will be quite likely to wonder how it is that such a mass of highly interesting and important matter as this book presents could so long have remained hidden from view. The answer, apparently, is no sufficiently expert hand has until now attempted the task of picking out the treasure from the surrounding rubbish.

Untiring industry in the examination of authentic records, peculiar ability in the marshaling and emphasis of facts, clearness and felicity of literary expression—these are the leading characteristics of Professor McMaster's work; entitling it to rank among the most excellent of historical productions.

Let us give a few extracts, showing the condition of some of our institutions as they were conducted only about a hundred years ago:

THE CONDITION OF AMERICAN WORKING PEOPLE IN 1784.

A wonderful amelioration has taken place since that day in the condition of the poor. Their houses were meaner, their food was coarser, their clothing was of commoner stuff, their wages were, despite the depreciation that has gone on in the value of the money, lower by one-half than at present.

A man who performed what would now be called unskilled labor, who sawed wood, who dug ditches, who mended the roads, who mixed mortar, who carried boards to the carpenter, and bricks to the mason, or helped to cut hay in the harvest time, usually received as the fruit of his daily toil two shillings.* Sometimes, when the laborers were few, he was paid more and became the envy of his fellows if at the end of the week he took home to his family fifteen shillings, a sum now greatly exceeded by four dollars. Yet all authorities agree that in 1784 the hire of workmen was twice as great as in 1774.

On such a pittance it was only by the strictest economy that a mechanic kept his children from starvation and himself from jail. In the low and dingy rooms which he called his home were wanting many articles of adornment and of use now to be found in the dwellings of the poorest of his class. Sand sprinkled on the floor did duty as a carpet. There was no glass on his table, there was no china in his cupboard, there were no prints on his wall. What a stove was he did not know, coal he had never seen, matches he had never heard of. Over a fire of fragments of boxes and barrels which he lit with the sparks struck from a flint, or with live coals brought from a neighbor's hearth, his wife cooked up a rude meal and served it in pewter dishes. He rarely tasted fresh meat as often as once in a week, and paid for it a much higher price than his posterity. Everything indeed which ranked as a staple of life was very costly. Corn stood at three shillings the bushel, wheat at eight and sixpence, an assize of bread was fourpence, a pound of salt pork was tenpence. Many other commodities now to be seen on the tables of the poor were either quite unknown, or far beyond the reach of his scanty means.

Unenviable is the lot of that man who cannot in the height of the season when the wharfs and markets are heaped with baskets and crates of fruit, spare three cents for a pound of grapes or five cents for as many peaches, or, when Sunday comes around, indulge his family with watermelons or cantaloupes. One hundred years ago the wretched fox grape was the only kind that found its way to the market, and was the luxury of the rich. Among the fruits and vegetables of which no one had then even heard are cantaloupes, many varieties of peaches and pears, tomatoes and rhubarb, sweet corn, the cauliflower, the egg plant, head lettuce, and okra. On the window benches of every tenement house may be seen growing geraniums and verbenas—flowers not known a century ago. In truth, the best kept gardens were then rank with hollyhocks and sunflowers, roses and snowballs, lilacs, pinks, tulips, and above all the Jerusalem cherry, a plant once much admired, but now scarcely seen.

If the food of an artisan would now be thought coarse, his clothes would be thought abominable. A pair of yellow buckskin or leathern breeches, a checked shirt, a red flannel jacket, a rust felt hat cocked up at the corners, shoes of neat's skin set off with huge buckles of brass, and a leathern apron comprised his scanty wardrobe. The leather he smeared with grease to keep it soft and flexible. His sons followed in his footsteps, or were apprenticed to neighboring tradesmen. His daughter went out to service. She performed indeed all the duties at present exacted from women of her class, but with them were coupled many others rendered useless by the great improvement that has since taken place in the conveniences of life. She mended the clothes, she did up the ruffs, she ran on errands from one end of the town to other, she milked the cows, made the butter, walked ten blocks for a pail of water, spun flax for the family linen, and when the year was up, received ten pounds for her wages. Yet small as was her pay she had, before bestowing herself in marriage on the footman or the gardener, laid away in her stocking enough guineas and joes to buy a few chairs, a table, and a bed.

But there is one other change which has, it must be admitted, done far more to increase the physical comfort of the poorest class than better food, higher wages, finer clothes.

Men are no longer imprisoned for debt. No crime known to the law brought so many to the jails and prisons as the crime of debt, and the class most likely to get into debt was the most defenseless and dependent, the great body of servants, of artisans, and of laborers, those in short who depended on their daily wages for their daily bread. One hundred years ago the laborer who fell from a scaffold or lay sick of a fever was sure to be seized by the sheriff the moment he recovered, and be carried to jail for the bill of a few dollars which had been run up during his illness at the huckster's or the tavern. . . .

For more than fifty years after the peace there was in Connecticut an underground prison which surpassed in horrors the Black Hole of Calcutta. This den, known as the Newgate prison, was in an old worked out copper mine in the hills near Granby. The only entrance to it was by means of a ladder down a shaft which led to the caverns under ground. There, in little pens of wood, from thirty to one hundred culprits were immured, their feet made fast to iron bars, and their necks chained to beams in the roof.

The darkness was intense, the caves reeked with filth, vermin abounded; water trickled from the roof and oozed from the sides of the caverns; huge masses of earth were perpetually falling off. In the dampness and the filth, the clothing of the prisoners grew mouldy and rotted away, and their limbs became stiff with rheumatism. The Newgate prison was perhaps the worst in the country, yet in every country were jails such as would now be thought unfit places of habitation for the vilest and most loathsome of beasts. At Northampton the cells were scarce four feet high, and filled with the noxious gases of the privy vaults through which they were supposed to be ventilated. Light came in from two chinks in the wall. At the Worcester prison were a number of like cells, four feet high by eleven long, without a window or a chimney, or even a hole in the wall. Not a ray of light ever penetrated them. In other jails in Massachusetts the cells were so small that the prisoners were lodged in hammocks swung one over the other. In Philadelphia the keeps were eighteen feet by twenty feet, and so crowded that at night each prisoner had a space six feet by two to lie down in.

Into such pits and dungeons all classes of offenders of both sexes were indiscriminately thrust. . . . Modes of punishment long since driven from the prisons with execrations as worthy of an African kraal were looked upon by society with a profound indifference. The tread mill was always going. The pillory and the stocks were never empty. The shears, the branding iron, and the lash were never idle for a day. . . . A wretch so hardened as to be recommitted was branded on the arm. Keepers knew no other mode of silencing the ravings of a madman than tying him up by the thumbs and flogging him till he was too exhausted to utter a groan.

The misery of the unfortunate creatures cooped up in the cells, even of the most humanely kept prisons, surpassed in horror anything ever recorded in fiction. No attendance was provided for the sick. No clothes were distributed to the naked; such a thing as a bed was rarely seen, and this soon became so foul with insects that the owner dispensed with it gladly. Many of the inmates of the prisons passed years without so much as washing themselves. Their hair grew long. Their bodies were covered with scabs and lice and emitted a horrible stench. Their clothing rotted from their backs and exposed their bodies, tormented with all manner of skin diseases and a yellow flesh cracking open with filth.

* Six shillings made a dollar, New England currency.

Aqua Regia for Preserving Meat.

According to an Italian journal, Pavesi has studied the action of very dilute aqua regia upon meat and other animal substances, and has found it to be an excellent preservative, and that pieces of meat weighing two pounds kept unchanged in wooden vessels filled with it for years, retaining their flavor also. Meat treated with it may afterward be dried at 60° or 100° Fahr., without any further change than a decrease of volume and acquiring a brown color. If placed in water for a few hours, the meat regains its original softness and natural color.

The experimenter does not give the exact proportions in which he mixes the acids and water, but says that "the solution must have a slightly acid taste."

The process is also suited to the preservation of animal substances for scientific purposes, such as anatomical and pathological specimens.

A mixture of sodium chloride and potassium nitrate has been in general use for centuries for preserving meat, so that the only novelty consists in omitting the alkaline bases and substituting the less objectionable hydrogen; in other words, using the acids instead of their salts. H.

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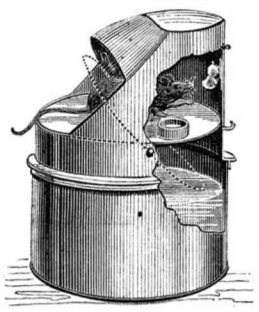
RECENT INVENTIONS.

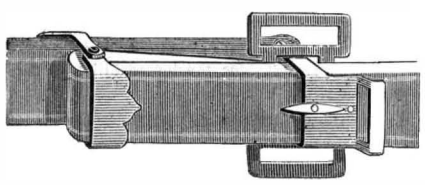
New Animal Trap.

The engraving shows an animal trap which is automatic and capable of resetting itself, or it may be sprung and set by an attendant who waits and watches for the game. A cylindrical vessel, the upper edge of which rises from the rear to the front, rests upon a tank filled with water. In the vessel a platform is pivoted in such a manner that it can swing up and down on the line from rear to front. At the rear of the vessel the platform rests on a projection, and is drawn downward by a weight attached to its under side. A curved spring is attached to the side of the vessel, and when the platform strikes against the spring, it forces the platform down again. On the inner surface of the raised part of the vessel a bait hook is fastened, and an additional bait hook is attached to a vertical slide, fitted in a groove in the elevated side of the trap, to slide when the bait is pulled upon by the animal as he sinks downward with the swinging platform, in order that he may not be startled and turn back until it is too late for him to get out. The trap is provided with a catch bolt, which may be made to hold the platform until the trapper desires to trip it by means of a cord attached to the bolt. This novel and effective trap has been patented by Mr. T. B. Turley, of La Mine, Mo.



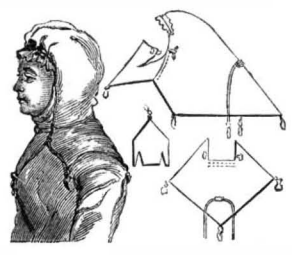
New Trace Buckle.

Mr. Henry J. Butler, of Dallas, Polk. Co, Oregon, has patented an improvement in harness trace buckles, the object of the improvements being to provide a buckle that obviates the use of the box loops or strap loops ordinarily attached to the hame tug, to connect the hame tug with the trace by the buckle in a manner that divides the strain upon the leather, thus obviating the entire strain being upon one point alone in the trace, as is the case with other trace buckles, and to obviate having any part of the buckle on the hame tug or the trace while in the course of construction, the hame tug and trace being entirely finished before the buckle is attached. The annexed engraving represents the buckle.



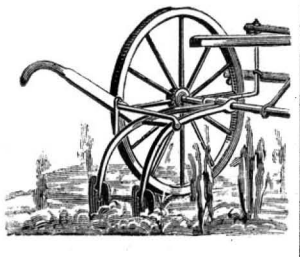
Ladies' Head Wear Protector.

We give an engraving of an article that will be appreciated by our lady readers. One view shows the manner of applying the protector, and the other the several pieces of which it is formed, laid out flat to show their shape. The protector made in this manner, when placed on the head of the wearer, furnishes a perfect covering and protection for the hat or bonnet of the wearer, covers the neck, shoulders, and breast, and also protects the sides of the face and the throat. It is cheap, easily put on and removed, looks well, and when removed may be rolled up to occupy small space, so that it may be carried in the pocket or shopping bag, ready for all emergencies of weather. This invention has been patented by Julia A. Kneeland, of 37 North St., Salem, Mass.



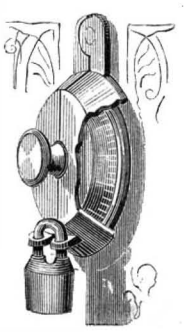
Gopher Attachment to Cultivators.

An improved shovel for cultivators has been patented by Mr. John E. Mitchell, of Fowler, Ind. The invention consists of a novel gopher attachment to cultivator shovels for cultivating corn, being designed for ridging the earth up around the plants in the later dressing, when they are well grown, without injuring the roots. To the blades of a common cultivator plow, or any equivalent form of the same, as the narrower "bull tongue," the inventor applies or forms together therewith the gopher extension upon the right or left side, according to the side of the row of plants the shovel is to work, the said extension being located about midway between the top of the taper of the point and the top of the shovel, and its surface being in uniformity with that of the shovel, that is to say, flush and smooth therewith at the junction. By preference the plow plate, together with the attachment, will be cut out of a plate together; but they may be welded together, if preferred.



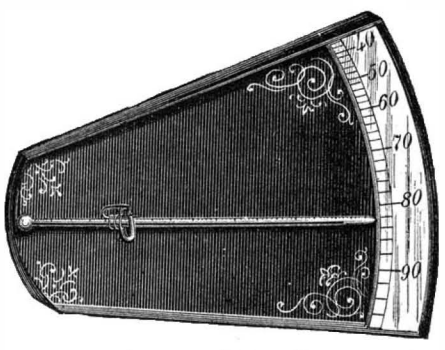
Guard for Safe Locks.

The object of this invention is to cover and protect the dial plates of combination safe locks when the owner desires to prevent others, knowing the combination, from opening the safe. The device consists of two semicircular plates, which are so formed as to cover the dial plate of a combination safe lock, while their outer edges rest against the safe door. In the center of the adjacent edges of the plates are formed semicircular recesses to receive the neck of the knob. Upon the plates at one end, or their straight edges, are formed lugs, the outer ends of which overlap, and are hinged to each other, so that the two plates can be swung apart to allow them to be placed upon and removed from the knob and the dial plate. Upon the ends of the plates, opposite the hinged lugs, are formed eyes in such positions that the arm of a padlock can be readily passed through them. When this guard has been applied, it will be impossible for any one to see the dial plate and unlock the safe without first removing the guard. This invention has been patented by Mr. Philip Laubenberger, 252 Columbia Street, Brooklyn, N. Y.



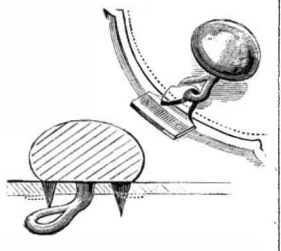
The Balanced Thermometer.

Among the inventions of recent date which bid fair to prove beneficial to the public and profitable to the inventors, the balanced thermometer deserves mention. It has been a desideratum with thermometer makers for some years to secure an instrument which could be read at a distance without interfering with the regular occupation. This object is secured by this instrument in a very ingenious way. As shown in the cut, a mercurial tube graduated, is balanced on needle points, the tube itself acting as a pointer on a dial carefully constructed for the purpose. The pointer being once adjusted to indicate the same temperature as shown by the mercury in the tube, the weight of the mercury will afterward determine the direction of the pointer and show the temperature. This thermometer was patented in December last by Messrs. Kirk & Brayton, of Phelps, N. Y., and is now being manufactured by the Geneva Balanced Thermometer Company, of Geneva, N. Y. We understand that a company is being organized in this city for the sale of instruments and territory.



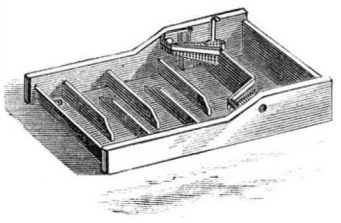
Novel Shoe Fastening.

The engraving shows a shoe fastening recently patented by Mr. Samuel A. Milton, of Clinton, Mo., which resembles a button fastening, but consists of concealed hooks and eyes. The button is provided with a shank terminating in an elongated eye combined with a hook adapted to be passed through this eye, the button being attached to one flap of the shoe and the hook to the opposite flap. The button is secured by means of a plate attached to the under side of the same, and provided at the ends with sharpened prongs, which are forced through the flap and bent against the under side.



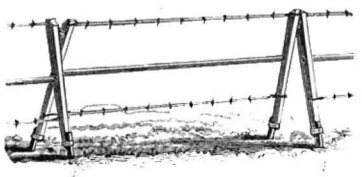
Improved Sugar Evaporator.

We give an engraving of an improved sugar evaporator invented by Messrs. R. D. Shendelbower and Henry Pressler, No. 1,307 West Green Street, Louisville, Ky. In this pan all of the parts exposed to the fire are seamless, so that there is no solder to melt, and thus cause leaky joints. The pan is provided with a very perfect skimming device for cleaning the sirup before it enters the finishing part of the pan, and the skimmers are so arranged as to receive the froth as it boils up, the skimmer being made lower at the sides than at the center for this purpose. We are informed by the inventor that this pan works perfectly and is very durable. Further information may be obtained by addressing the inventors as above.



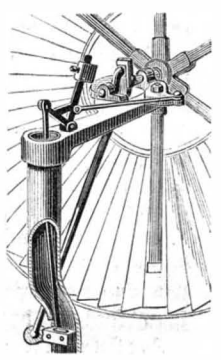
Portable Fence.

The principal advantages of the fence illustrated are its cheapness, owing to the small amount of material used; its strength, owing to the fact that the panels brace each other; and its durability. All nailing is avoided and the posts are held free of the ground. The fence may be very easily put up and as easily taken down, and can thus be moved from place to place at a comparatively small outlay of time, labor, and expense. The panels of the fence are each formed of posts, a central wooden rail, and upper and lower wires. The posts of one end of the panel are provided, near their upper ends, with the eyes or staples, while the posts of the other end of the panel are provided, near their upper ends, with the hooks hooked into the eyes of the adjacent panel for holding the panels together at the top. The posts are made short and blunt at their lower ends, and when the fence is set up are held clear of the ground by the short stakes of wood or iron, driven into the ground, the posts being held to the stakes by the iron rings or bands. The stakes are driven diagonally into the ground, and hold the posts of the different panels at opposite angles, so that when locked together at the top the panels brace each other, and thus make the fence very stanch, so that it will resist all ordinary wind storms. By connecting the adjacent panels in this way, it will be seen that each panel may be opened as a gate. This invention has been patented by Mr. Enoch H. Alden, of Alexandria, Minn.



Improved Windmill.

The engraving represents an improved windmill recently patented by Mr. Charles D. Bowlus, of Ohio, Ill. Both the wheel and its mountings are of peculiar construction. The wheel is made concave to bring its weight over the bearings. The mill is mounted on a vertical tube, which is bent above its bearing, into an eccentric position for the turntable of the wheel, to enable the wheel to shift around with the wind without the use of a tail vane. The crank is arranged in relation to the other parts, so that it acts positively and without lost motion. The device for regulating the speed of the mill is very simple and easily managed, and the same may be said of the other parts of the machine. This is a great advantage, as a windmill, of all machines, is most likely to be situated where simplicity of construction will be appreciated.



Estimation of Glucose in Sugar.

A. Vivien's method of estimating glucose in quantities less than 0·1 per cent is given in *La Succerie Indust.* Copper solutions of different strengths are employed, 10 c. c. of which correspond to 0·01, 0·009, and so on, down to 0·001 gramme of glucose. The quantity of glucose is found by the color of the solution after boiling, and from the red precipitate. The experiment is conducted as follows:

He dissolves 10 grammes of sugar in about 200 c. c. of water, then adds 10 c.c. of the copper solution corresponding to 0·01 gramme of glucose, boils, and allows the precipitate to subside. If the blue color is gone and a red precipitate formed, the sugar must contain at least 0·1 per cent of glucose, which can be estimated in the usual manner by titration with the aid of a burette. If, however, decolorization of the solution does not ensue, the experiment is repeated with weaker copper solutions, until one is found of such strength as will just be decolorized. With a little practice it is possible to pick out the proper solutions very quickly. Of course, inverted sugar, or any other reducing substance, would vitiate the correctness of such tests as these, and render polarization absolutely indispensable.

An Easy Test for Adulterated Sugar.

A few years ago P. Cassamajor proposed the use of methyl alcohol for the detection of glucose when mixed with cane sugar. At a recent meeting of the American Chemical Society he announced the fact that his test would not work when anhydrous grape sugar (amylose) instead of ordinary hydrated glucose is used. In place of that test he now suggests that a sample of the suspected sugar be placed in a beaker-glass or teacup, and an equal quantity of sugar known to be pure in a similar vessel. On adding a little water to each and placing the vessels in hot water, the adulterated sugar will melt much sooner than the other and appear more like molasses. On allowing the two solutions to cool, the pure cane sugar will become solid again, while the adulterated article will remain a sirup. In a sample sent to him to test he found that about 20 per cent of crystalline glucose had been added. The form of the crystals in the anhydrous glucose were, he said, easily distinguishable from either cane sugar or ordinary hydrated glucose by means of the microscope. The quantity can only be determined by optical means.

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ENGINEERING INVENTIONS.

A wind driven vehicle is the subject of an invention recently patented by Mr. Oscar W. Burnell, of Dorrance, Kan. The wind wheel is mounted on a frame, and by a series of cog wheels conveys the power to the driving gear, and thus propels the vehicle. The inventor designs his wind propeller for farm work, to take the place of horses or steam power in the field.

A novel car brake has been patented by Messrs. Adolph G. Hamm and Harry W. Eisenbise, of Burlington, Iowa, which is operated by the momentum of the car. This railroad car brake is operated by ingenious mechanism, which transfers the power derived from the motion of one of the axles or trucks, to the brake. The shoe of the brake impinges against the outside of the car wheel.

Improved machinery for moulding bricks and tiles has been patented by Mr. Thomas Le Poidevin, of Guernsey, England. Connected with an ordinary pug mill are a series of moulds mounted on trucks, which are run on rails underneath the mill to be filled. The line of moulds are made to travel on the track one after the other as filled out of the way of the mill, by means of gearing operated from the pug mill. The invention seems very practical, and it is certainly very simple in its operation.

An improved car brake is the subject of a patent recently granted to Mr. Edgar T. Stone, of Spanish Hollow, Oregon. A cone-shaped friction clutch meshes into a recess formed on the inner side of the car wheel. The cone clutch is forced by jointed levers attached to a rod running the length of the car into the recess in the wheel, wedging it so tightly as to prevent its revolution. A spring is arranged for relieving the clutch when it is not in use. The construction of this brake is simple and powerful in action.

Mr. M. A. Dees, of Moss Point, Miss., has recently patented a device for increasing the traction of locomotive driving wheels for the purpose of preventing slipping of the wheels on the track, specially when starting up the locomotive. A vertical cylinder on the rear of the locomotive is connected with a beam attached to the piston in such a way, that when steam or compressed air is admitted the piston will be forced upward, and the weight of the tender will work on the locomotive in such a way as to increase the traction of the driving wheels.

MECHANICAL INVENTIONS.

Mr. George H. White, of Escanaba, Mich., has patented an improved coal and ore chute for coal, ore, and other materials. The chutes are hinged to the bins at the doors through which the materials are to be delivered and are swung by a pulley up and down to connect and disconnect with vessels, cars, etc., to be loaded.

Mr. Jonathan Hendershot, of Shirtzville, Va., has recently patented a sawing machine intended specially for sawing logs in the woods, the machine being so constructed that it can be readily lifted up and placed over the logs. This invention renders it possible to construct a very simple saw mill which is easily operated by hand or any other power, and inexpensive to build.

Improvements in the treadle of sewing machines have been patented by Mr. Herman Cramer, of Sonora, Cal. The invention consists of a vertical double brace joining the legs of the two ends of a sewing machine, and provided with holes through its lower extremities to serve as bearings, in combination with a treadle provided with trunnions fitted to oscillate in these bearings.

An improved thread doubling machine has been patented by Mr. Albert L. Washburn, of Hartford, Conn. The invention consists in a machine designed to produce a thread of evenly laid strands, and this is accomplished by means of a simple device for regulating and equalizing the tension of the different strands while doubling the thread by using with a tension ring two or more pairs of guides.

Mr. Lester Traxler, of Butler, O., has patented a portable saw mill which has several advantages over those at present in use. It is of such construction that it may be put up and taken down again and removed to another place with facility. The framework is light in build, so that it may be easily transported, and may be put up any number of times alike, and is of such a form that the lining up of the saw frame and tracks, which had need to be done formerly at every removal, is wholly avoided.

Mr. Ernst Gessner, of Aue, Saxony, Germany, has patented some improvements relating to a machine for raising a nap on cloth by means of teasels. The improvements consist in the peculiar means for bringing the cloth into contact with one or both of the gig cylinders or removing it therefrom without discontinuing the run of the machine, and in the arrangement of the teasels on the cylinder. Another result of this invention is the ingenious method employed for holding the axial shafts of the teasels in their bearings.

A novel block presser for wood paper pulp machines has been patented by Mr. Norman H. Brokaw, of Marinette, Wis. The invention consists of a device whereby when compressed air, steam, or a liquid is admitted in the cylinder the head block will be moved downward, and will press the block of wood on the grinding surface, and when this head block has descended sufficiently, a latch is opened, the inner ends of the levers are released, the cocks are reversed, and the piston and head block will be raised.

Letters patent have been granted to Messrs. Job C. Chambers and Silas Chambers, of Dallas, Tex., for an improved machine for digging wells and cisterns. A frame is provided with an auger for penetrating the ground in a similar manner to the ordinary post hole auger, which the machine very much resembles. Connected to the shaft which bears the penetrating auger, is a gang of plowshares, which break up the earth and conduct it into a receiver, when it is raised to the surface by the ordinary pulley and rope appliance.

An improved punching and shearing machine has been patented by Mr. John M. Sailer, of Portland, Mich. The invention consists in a punching and shearing machine constructed with one jaw pivoted in the machine frame, and the other jaw connected with this pivoted jaw by means of link bars pivoted to the sides of both jaws. The jaws are provided on the adjoining edges with guide lugs resting sidewise against each other, for preventing lateral movement of the jaws. The jaws can be operated by means of a right and left hand screw, by a cam, or other suitable device.

An improved bowlder grapple, of cheap and simple device, for removing stones which are embedded in the soil, has been patented by Mr. John Marshall, of Cordova, Ill. The device consists of a pair of grapple hooks formed by bending over the ends of a yoke-shaped bar of steel or iron, these arms being bent at an angle of about 90° to plane of yoke. This grapple hook is joined by a chain to another pair of hooks or fork having long, metal arms, with an eye at its upper end for attachment of a rope or chain by which a team may be attached for drawing the bowlder out of its bed. The fork may be used as a sort of sled for removal of the stone when it has once been fairly dislodged from its bed.

Improvements in two-wheeled vehicles, the object of which is to provide an equalizing device whereby the body of a two-wheeled gig or cart shall always be kept level, regardless of the weight upon the seat, have been patented by Mr. Anders Rasmussen, of Oshkosh, Wis. The equalizer consists of two levers, connected together end to end by a sliding joint, and pivoted near their centers to the ends of a rectangular bar. The equalizer is placed at the center of the axle, and its forward end is secured to the body of the gig, while its rear end is connected with the ends of the spring. With this construction, weight upon the seat of the vehicle will cause the outer ends of the levers to be depressed equally, whereby the downward pressures thus exerted both at the front and the rear of the body will counterbalance each other and allow the body to retain its level position.

An improved process of and apparatus for obtaining chlorine and sodium has been patented by Mr. Andre Leopold Nolf, of Brussels, Belgium. The invention relates to means and apparatus for decomposing chloride of sodium by dynamic electricity into two constituent elements, viz., sodium and chlorine, the decomposition being effected by means of a special form of vat which the inventor calls the "Nolf Apparatus," and into which is placed the solution of chloride of sodium to be acted upon. The various effects produced simultaneously by the Nolf apparatus are as follows: The sodium is reduced to a metallic state and prevented while in that state from decomposing the water of the solution in which it is placed. The chlorine is allowed to disengage itself in a gaseous state, so that it may be easily collected. All polarization of the electrodes in the bath which is subjected to decomposition is prevented. The solution of chloride of sodium is always maintained at the same degree of concentration without the necessity of stopping the decomposition.

A coffee separator of improved construction has been patented by Mr. Patrick P. Brannon, of Santa Ana, San Salvador, Central America. A frame supports an endless canvas apron that passes over two rollers pivoted to the side boards of the frame. Above this apron is arranged a hopper the opening at the lower end of which is provided with a valve plate, which is opened by every revolution of the driving shaft, thus causing an intermittent discharge of the coffee. Underneath the opening a board is located to receive the coffee as it falls, and spread it evenly over the surface of the apron. With this arrangement the round berries will roll down the endless apron, and fall into a spout located at the lower end of the apron. The flat berries on the contrary will be carried up by the apron and will fall into a spout arranged at the other extremity of the endless apron. Combs are arranged both above and below the spout of the hopper, to turn the berries over, whereby the flat ones will be prevented from rolling down the entire length of the apron, and the round berries will likewise be dislodged and sent to their proper receivers.

AGRICULTURAL INVENTIONS.

An improved shovel for cultivators has been patented by Mr. John E. Mitchell, of Fowler, Ind. The invention consists of an improved gopher attachment to cultivator shovels for cultivating corn, being designed for ridging the earth up around the plants in the later dressing, when they are well grown, without injuring the roots.

Mr. Henry Grebe, of Omaha, Neb., has patented a novel hay gatherer, an improvement upon a patent granted to same inventor July 15, 1879. It consists in providing the side gates of the brake with slotted sweep bars. A seat is arranged so that its position may be changed on the machine to suit the convenience of the operator.

A rotary colter of improved form has been patented by Messrs. S. M. Weston and C. T. Shanner, of Somerville, Ind. A rotary colter is constructed with movable bearings for taking up the wear, and a locking key and pawl for fastening the colter to its axle, by which construction all irregular movements of the colter will be prevented and the colter will advance in a straight line.

A novel plow point and colter, constructed in such a manner that it may be secured in position without any other means than contact with the plow point, has been patented by Mr. Hugh F. Lyle, of Staunton, Va. The colter is so constructed that when the plow point is bolted in position, it will overlap the lower end of the colter. One bolt is thus made to secure both the colter and plow point in place.

MISCELLANEOUS INVENTIONS.

An improvement in the construction of a harness saddle together with its shaft tug and loop, has been patented by Mr. Victor Smith, of Bedford, Pa.

A patent has recently been granted to Mr. W. J. Morand, of Passaic, N. J., for a simple method of connecting whip tips with their stocks by using coils of wire brazed to each other, forming a neat and cheap ferrule.

A novelty in the way of a collar button is the subject of a patent granted to Mr. J. E. Vanderbilt, of Brooklyn, N. Y. The button consists of three plates, an inner plate, a central semicircular plate, and an outer plate, all connected by one shank, forming a very strong and unique fastening.

An improvement in letter boxes has been patented by Mr. Marcus R. Jones, of Baltimore, Md. The object of the invention is to provide a time indicator for letter boxes, which the carrier, when he collects the mail, shall set to indicate the next hour for collecting the mail from the box.

A novel invention in the form of a barrel heater has been patented by Mr. Silas Anson, of Bellevue, Mich. A platform is provided for setting barrels on to be heated, with a fire grate in the center, and a fire pot is located on it, the object being to provide heat and shrink barrels without burning them.

Mr. D. M. Steward, of Cincinnati, O., is the patentee of a new process of treating steatite and applying it to electric wires for producing insulation. The inventor treats his steatite with ammonia and muriatic acid, subjecting the composition to heat during the process.

A hand crimping tool of a simple and improved form has been patented by Mr. James Fishwick, of Mainville, Ohio. It consists in a couple of levers pivoted together like a pair of scissors, provided with corrugated crimping faces, of brass or other non-corrosive metal, between which jaws or faces, after heating to a suitable degree, the article to be crimped is held.

A new composition for tanning hides has been patented by Mr. James F. Cranford, of Oak Hill, Ala. The ingredients of the tanning mixture consist of tanner's ooze, alum, salt, saltpeter, and lye soap. The ooze is made from the inside bark of the mountain oak or white oak, or may be had from other sources, but preferably from the latter.

An improvement in doors for grain cars and like purposes is the subject of a patent granted to Mr. Robert J. Walker, of Girard, Ill. The door is made in two parts and hinged together, and is also provided with sliding hinges, which enable the door to be swung upward and edgewise against the side of the car when it is not required for use.

A fire escape is the subject of a recent patent granted to Mr. Elmer A. Converse, of Monticello, O. The escape consists of a rope ladder provided with stops which are fastened at either end to the rope by wire ties. The upper end of the ladder is a hook for hitching to a staple in the floor of the room, when the ladder is required for service.

A spreading stick for hammocks is the subject of a patent recently granted to Mr. Jos. H. Bates, of Walton, N. Y. The invention provides a notched spreading stick to receive the cords, to which is fitted a retaining rod. The notched stick insures equal strain on all the cords of the hammock, and the retaining rod holds the cords firmly in place.

A snap hook of improved form has been patented by Mr. David G. Sheridan, of Bridgeport, Conn. A snap pawl for securing the ring or other object is pivoted to the hook near the point, and provided with a spring, so as to snap over the ring after entering the hook. The pawl is provided with wing plates projecting from its edges, for holding the ring or other object securely.

A die for welding links has been patented by Mr. Frank A. Iddings, of Warren, O. The die relates specially to the welding of links used in railroad car couplings. By a peculiar construction of welding dies increased facility is afforded for opening the dies when necessary to remove the welded link. A finishing die is likewise provided which operates in connection with the welding die.

A sawdust conveyer for the conducting of the sawdust and shavings in wood working mills, and the light waste produced in other manufacturing establishments, from the building or into the boiler furnaces, is the subject of a recent patent to Mr. James M. Elliott, Jr., of Gadsden, Ala. The introduction into mills of exhaust sawdust and shavings conveyers renders wood working establishments less liable to take fire and burn.

A device for separating pecan and other nuts from the leaves, hulls, and other trash has been patented by Mr. John H. Dolman, of Albany, Tex. The machine is provided with an inclined series of parallel positively driven rollers, geared to rotate toward each other at such a distance apart as to allow of the leaves and other refuse falling through between them, but conducting the cleansed or separated nuts away from the leaves.

An improved miner's pick has been patented by Mr. Harvey F. Seybert, of Brady's Bend, Pa. The invention consists in a pick, the handle of which is provided with a spiral spring extension, which is designed to relieve the workman from the jar and shock of striking blows with the tool, and also to insure more effective action by the tool. The spring can be used on any other handle as well as a pick handle, and it is made to fit snugly the handle in use.

An ingenious toy in the shape of a musical top has been patented by Mr. Max Dannhorn, of Nuremberg, Germany. This musical top is provided with a plate containing a series of reeds arranged in a circle, on which plate a second plate provided with a single slot is adapted to revolve, so that, when the slot comes successively over the several reeds, a current of air passes through the casing of the top from top to bottom and through the reeds, which are thus sounded successively.

A simple fanning attachment for sewing machines has been patented by Mr. Joseph H. Tabony, of New Orleans, La. The invention consists in a telescopic shaft to which is pivoted a fan which is operated by a rod connection with the treadle of the machine. The fan can be adjusted to any reasonable height, and may be given a sweep of considerable extent. The fan is operated by the same treadle used in operating a sewing machine, and is intended to be used usually in that connection.

Mr. Jacob D. Spang, of Jacksonville, Fla., has patented a novel game board, which is an improvement upon letters patent granted to same inventor March 26, 1874. The game board represents a miniature race track, furnished with a race field, a track or platform, and suitable hurdles and stops. Balls, so marked that they may be distinguished one from the other, are used to represent horses. The balls are set in motion simultaneously, and the one first reaching the goal situated at the further extremity of the board is declared winner.

A difficulty has been heretofore experienced in securing a fair sample of oil out of casks for testing purposes, owing to the variation in the purity of the oil at different strata therein. Mr. Otto Schubert, of Parkersburg, W. Va., provides a testing glass on which is marked a graduated scale. By his process of manipulating the oil which his specification explains very minutely, he is enabled by the use of his graduated glass to arrive at the specific gravity of the oil, and it also indicates its purity.

An improved handle cap for traveling bags has been patented by Mr. Henry S. Craus, of Brooklyn, N. Y., and the object of the invention is not only to increase the facility of manufacture of bags, satchels, etc., but it increases the security of the attachments. A handle cap for bags, satchels, and baskets is constructed with a cap plate attached to the bag or satchel, and provided with a slotted hollow projection to receive the connecting head and stem, whereby a firm and durable connection is formed between the handle and the bag or satchel.

Mr. A. M. Rosenbrugh, of Toronto, Canada, has recently patented a portable galvanic battery, in which the elements are attached to the hydrostat plate. The drip cups for the elements are suspended when the battery is not in action. The case of the galvanic battery has a series of dripping cells, and cells with exciting fluid. The cells are arranged alternately. A set of hydrostat plates covering two sets of cells has a series of elements on one side and on the top a conductor, which connects the elements of one plate to those of the next.

An improved carpet cleaning apparatus has been patented by Messrs. William Bowman and Ernest Hunscher, of Cleveland, O. A tower is constructed of suitable height, and provided with an endless carrier for elevating the carpets, and also friction and tumbling frames over which the carpets roll in their descent. By this movement the carpets are turned end for end and rolled and tumbled about, so that, practically, they clean themselves, and no one carpet comes in contact with another. The operation being in the open air, and the tower open at all sides, the dust and dirt, are carried away by the wind.

An improvement in the manufacture of candies, etc., has been patented by Mr. August Neuhausen, of Chicago, Ill. The invention consists in crystallizing candies or confections direct in the boxes, which hold a given weight, and which constitute the packages of commerce. The method of crystallizing is the same as is already practiced in pans, and after the candies or confections have been crystallized, the boxes may be shipped directly to customers. In this way the handling of the crystallized articles in removing them from the pan to the boxes is obviated, and the damage formerly done to the confections is avoided.

A novel wagon hound has been patented by Mr. Andrew J. Harper, of Unionville Center, O. Four iron hound bars, are each formed at their front ends with eyes, through which passes a long pivot bolt that couples them to the tongue. Two of these bars pass over the top of the bolster, and two of them pass underneath the axle, which two sets then converge toward each other in the rear of the axle, and are bolted respectively to the top and bottom of a wooden crossbar. The bars cross the bolster and axle without any notch being cut in the same. It is claimed that by this improved hound the cutting away of the axle and bolster is avoided, and greater strength is secured.

A simple breech loading rifle has recently been patented by Mr. A. S. Jones, of Olivet, Dak. Ter. It belongs to the class of fire arms using a hinged breech block, fitted to swing upward and forward in opening the breech for loading, and is so arranged that the gun may be used either with or without bringing into play the magazine supply of ammunition, which is located as usual in the stock. There is a plunger back of the breech, which, when pressed down, frees the first cartridge in the magazine, and permits it to go into its place in the gun, by the pressure of a spring on the rear of the cartridges. The cocking of the hammer releases a latch holding the breech block in place, which is then opened by a spring in rear of the block.

A novel station indicator has been patented by Mr. Harvey A. Holloman, of Kingston, Tex. The invention consists in a box provided with an opening in its front, at points near the lower and upper edges of which opening are arranged pairs of rolls, said box having drums journaled in the top and bottom, to which drums a band is attached, bearing the names of the stations and stretched between said rolls, which band extends across the opening of the box. The drums are provided with crank handles for turning them, one of which crank handles is connected with a bell hung on a bracket of the box, whereby the bell will be sounded when the crank handles are turned to shift the band, thus calling the attention of the passengers to the station indicated.

An interest calculator designed to facilitate the computing of the interest on any desired sum of money for any desired number of days, months, or years has been patented by Mr. Marshall Todd, of Danville, Ind. A box having its top divided into a series of subdivisions marked "one day," "two days," "three days," etc., is provided. These subdivisions are each provided with an aperture, through which the interest numbers on sliding cards in the box can be seen. These cards are each provided with a row of numerals from 0 to 9, inclusive. By drawing out the cards until the numerals expressing the desired number of units, tens, hundreds, etc., will show in apertures in the cover of the box, the interest on these sums will appear in the apertures of the subdivision in the cover of the box.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The H. W. Johns Mfg. Co., 87 Maiden Lane, New York. manufacturers of asbestos packing and covering for all purposes, have recently made improvements in the manufacture of rod packing for steam, water, etc., by which its efficiency and durability is materially increased. These improvements consist in the arrangement of the fiber to give the packing a greater degree of elasticity, and at the same time to prevent its disintegration when in use.—*American Machinist.*

—— has just made his mark in the world, but the Esterbrook Pens are making their marks all the time. The reader is requested to mark this down.

Write J. Fitzgerald, publisher, 30 Lafayette Place, New York. for catalogue Humboldt Library of Science. Works by Tyndall, Huxley, Spencer, etc., 15 cents each.

The Best.—The Deuber Watch Case.

Boiler Scale Parties having fine specimens for sale or loan, address Jas. F. Hotchkiss, 84 John Street, N. Y.

Fire Brick. Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 204.

Curtis Pressure Regulator and Steam Trap. See p.206.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon. 24 Columbia St., New York.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

Gould & Eberhardt's Machinists' Tools. See adv.,p. 206.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 204.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p.206.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

For best low price Planer and Matcher. and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co.,430 Washington Ave.,Phil.Pa.

The Sweetland Chuck. See illus. adv., p. 206.

Knives for Woodworking Machinery.Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

The Celebrated Wooton Desk. See adv., page 206.

The Ide Automatic Cut-off Engine, designed for driving electric lights and furnishing steady, reliable power; high speed; superior construction; economy in fuel guaranteed. A. L. Ide, Springfield, Ill.

Comfort Dinner Pails.—Most convenient in use. For sale everywhere. Reardon, Ennis & Co., Troy, N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 190.

Scientific Books. See page 188. 100 page Catalogue free. E. & F. N. Spon, 44 Murray Street, N. Y.

Permanent Exposition.—Inventors' Institute, Cooper Union, N.Y. City. Every facility for exhibition of machinery, merchandise, and inventions. The expense is small—the advantages great. Send for particulars.

Drop Forgings. Billings & Spencer Co. See adv., p. 173.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 174.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.172.

See New American File Co.'s Advertisement, p. 174.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 172.

Steam Pumps. See adv. Smith, Vaile & Co., p. 172.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester,N.H.

Magic lanterns, stereopticons, cond. lenses, etc., on hand and made to order, C. Beseler, 218 Centre St., N. Y.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

Improved Skinner Portable Engines. Erie, Pa.

25" Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

For Power & Economy, Alcott's Turbine, Mt.Holly, N. J.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Engines, 10 to 50 horse power, complete, with governor. $250 to $550. Satisfaction guaranteed. More than seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven. Conn.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

NEW BOOKS AND PUBLICATIONS.

DES INGENIEURS TASCHENBUCH (The Engineer's Handbook). Edited by the "Hütte," in Berlin. Twelfth enlarged revised edition. 1,053 pp. Berlin: Ernst & Korn. 1883.

We have before us the twelfth edition of the "Engineer's Handbook," edited by the well-kuown Verein Hütte at Berlin. The work contains condensed information in mathematics, mechanics, machine building, motors, railroad engineering, technology, metallurgy, construction of buildings, physical, chemical, mathematical, and other tables, German building laws, and much other valuable information for civil and railroad engineers, builders, machinists, technologists, etc. The work is complete in every respect, is prepared with the greatest care, is very reliable, and is a model handbook. The additions of the new twelfth edition consist of new and valuable formulæ for mechanics, heat, the strength of materials, the statics of building constructions, parts of machines, motors, ship building, railroad engineering, technology, metallurgy, the German patent laws, and a number of new tables. The additions are too numerous to be mentioned singly. The work is provided with numerous illustrations.

REPORT OF AN EXAMINATION OF THE UPPER COLUMBIA RIVER AND THE GREAT PLAIN OF THE COLUMBIA, IN 1881. By Lieut. Thos. W. Symons, U.S.A. Washington: Government Print.

Lieutenant Symons' survey was undertaken to determine the navigability of the Upper Columbia and its adaptability to steamboat transportation. His report embodies a large amount of information with respect to the history, geography, and geology of this vast and little known region; its agricultural and commercial possibilities, and the engineering works needed to make the river and its tributaries navigable.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) A. F. R. writes: I am working in a machine shop, and I find trouble in tempering their tools. They had a well bored last winter, and the water contains some kind of mineral; it is not good to drink. Please inform me in your paper whether the water might contain something to make the tools crack, and how can I prevent it. A. You may find whether the fault is in the water by tempering in good water brought from some other place. Steel that cracks should be hardened at a very low heat, a full red. Ascertain how low a heat you can harden with. You may have used a low grade steel and fallen into the habit of hardening with high heat. Try low heat and good water, and also low heat and the water from your well.

(2) The T., B. & W. Mfg. Co. write: We are making a good many brass globe valves, and we are unable to get the color on the bodies as we want them. There one concern in this country that gets better color than anybody else, and we have tried very hard to get the desired color, but have failed. Now, we would like to ask you if you could give us a receipt by which we could obtain an orange color on the brass valve bodies? A. The orange color cannot be made upon yellow brass goods by dipping or any other process. You may make them of a fair yellow color by managing the time for taking from the moulds and dipping quickly in water and out, so that the remaining heat will dry them. The brilliant orange color can only be obtained in a tin alloy, and by timing the removal from the sand and dipping quickly in water. The following is one of the compositions that turn out a rich color:

Lake copper	1 pound.
Tin	1 ounce.
Zinc	½ "
Lead	½ "

Time, 7 to 20 minutes, according to thickness of castings.

(3) F. H. C. asks: 1. To what extent can hydrogen be heated without danger of its taking fire or exploding, if it is in an airtight bag where it has plenty of room to expand? A. Hydrogen can be heated to any extent without any danger of its exploding or taking fire, provided it does not come in contact with the air. 2. What temperature would rubber or gutta-percha stand without softening or melting? Please give the temperature for each. A. Both rubber and gutta-percha would soften at the temperature of boiling water. Vessels of either of these substances would be impracticable to use with hydrogen, except at ordinary temperature.

(4) S. M. writes: I wish to get some information about a zinc water paint. I have a receipt in which oxide of zinc, potato starch, aqueous solution of chloride of zinc, with tartrate of potash is used, but I have no formula for mixing it. A. Make a solution of starch, and also one of zinc chloride with potassium tartrate; combine these two and add sufficient zinc oxide to make the mass of such consistency that it may be handled with the brush.

(5) F. E. asks: 1. In the induction coil described in No. 160 of the SCIENTIFIC AMERICAN SUPPLEMENT, will paraffined paper in the condenser answer as well as the varnished? A. Yes. 2. How long a spark will the coil give by using a bichromate of potash cell of two plates, size 9 x 4 inches? A. About 1½ inches. 3. How many such cells are required to obtain the full effect of the coil? A. Two. 4. How much more electromotive force is produced in using two carbon plates instead of one in each cell? A. There is a slight increase.

(6) E. A. L. asks: Does air heat in proportion to its compression? Suppose 10 cubic feet of air at 70° Fahr. be compressed to 5 cubic feet, will the heat be raised to 140°? Must compression be sudden? A. Air at 70° compressed to one-half its volume will have a theoretical temperature of 170°. The compression must be sudden, and then an allowance must be made for a slight absorption of heat by the surrounding material. In practice you may get, by a continuous action in a pump, a temperature of 140°.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 20, 1883,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

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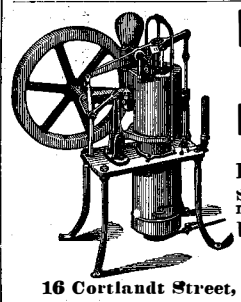

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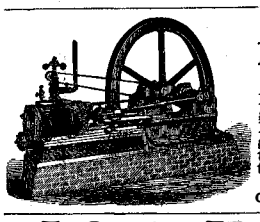

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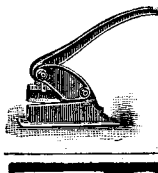

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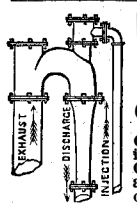

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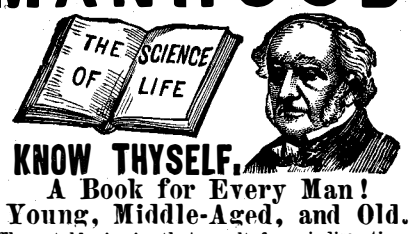

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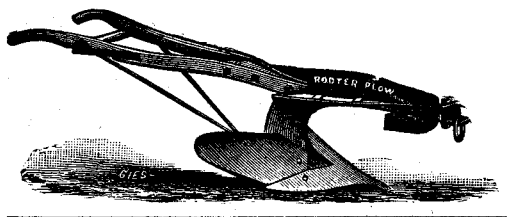

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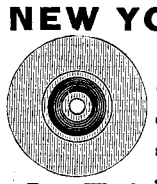

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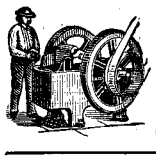

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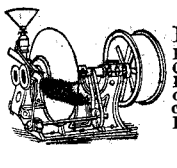

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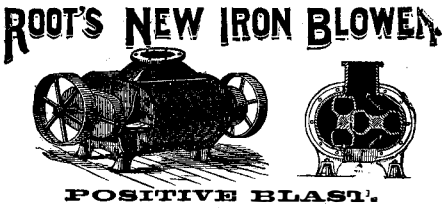

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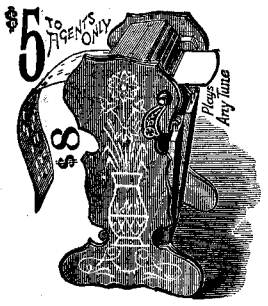

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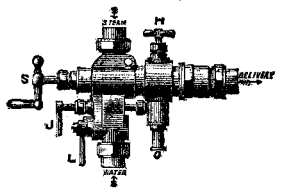

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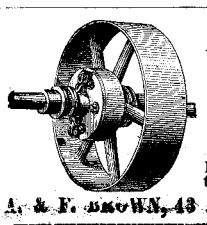

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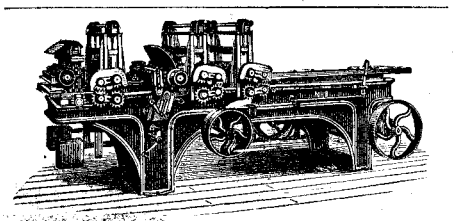

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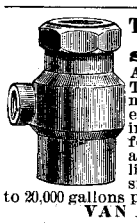

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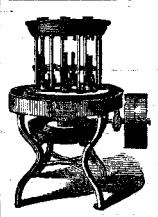

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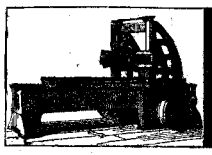

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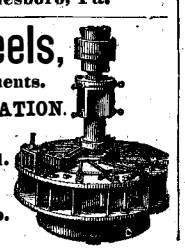

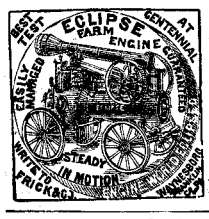

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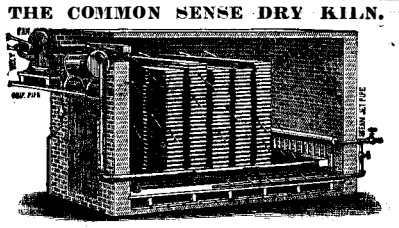

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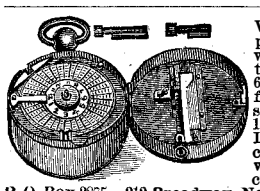

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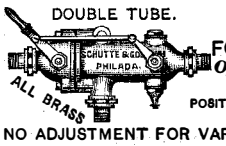

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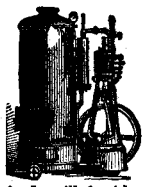

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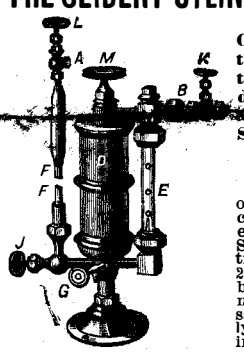

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